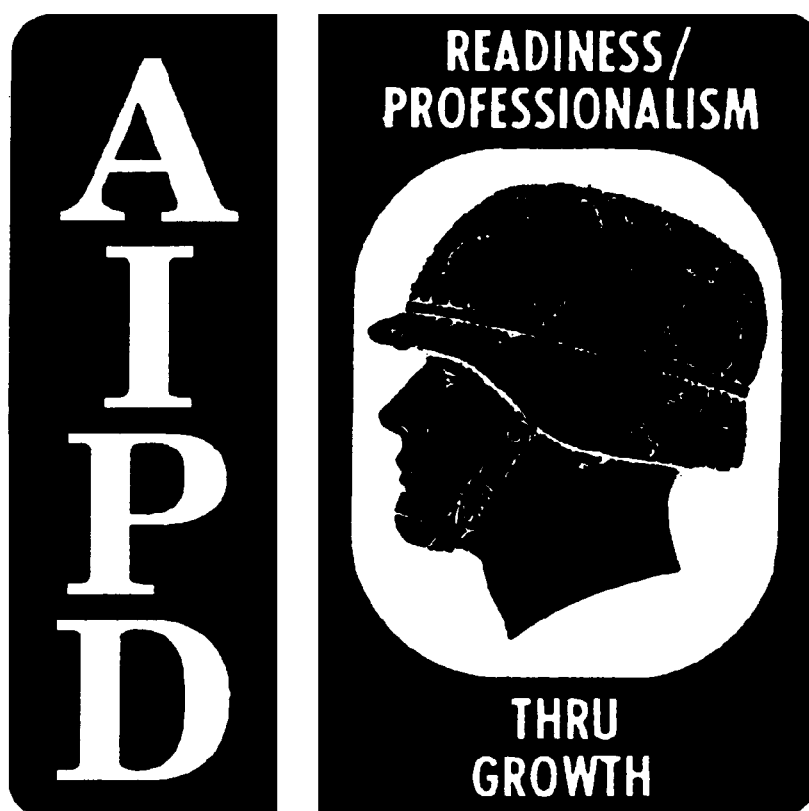


SUBCOURSE
MM5007

EDITION
8

ADJUSTMENT OF PPI, IFF, AND PRECISION
DISPLAY, AND PPI DELAY CONTROL



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM

AIR TRAFFIC CONTROL SYSTEMS/SUBSYSTEMS EQUIPMENT REPAIR
MOS 93D SKILL LEVELS 1 AND 2

PLEASE NOTE

Proponency for this subcourse has changed
from Aviation (AV) to Missile & Munitions (MM).

ADJUSTMENT OF PPI, IFF, AND PRECISION DISPLAY,
AND PPI DELAY CONTROL
(Development Date: 1987)

SUBCOURSE NO. AV5007

US ARMY AVIATION CENTER
FORT RUCKER, ALABAMA 36362-5000

3 CREDIT HOURS

GENERAL

The Adjustment of PPI, IFF, and Precision Display, and PPI Delay Control subcourse is part of the Air Traffic Control Systems/Subsystems Equipment Repair Course, MOS 93D. This subcourse is designed to teach the knowledge and skills necessary to troubleshoot and repair radar set AN/FPN-40. This subcourse is presented in one lesson consisting of four learning events. The lesson corresponds to a learning objective, as indicated below.

Lesson:

ADJUSTMENT OF PPI, IFF AND PRECISION DISPLAY, AND PPI DELAY CONTROL.

TASK

Describe the function and use of components used in the adjustment and operation of the precision display. Provide skills and knowledge necessary to adjust the planned position indicator (PPI) delay control and the PPI display. Describe the procedures used to adjust the identify friend or foe (IFF) display.

Whenever pronouns or other references denoting gender appear in this document, they are written to refer to either male or female unless otherwise indicated.

CONDITION

Performance-Oriented. Given this subcourse, pencil, and paper.

STANDARD

Performance-Oriented. Demonstrate competency of task skills and knowledge by correctly responding to 70 percent of the multiple-choice test questions covering radar set AN/FPN-40.

This objective supports SM Task 011-151-4002, Repair Radar Set AN/FPN-40; 011-151-4009, Adjust the Precision Display on Radar Set AN/FPN-40; 011-151-4007, Adjust PPI Control on Radar Set AN/FPN-40; 011-151-4006, Adjust PPI Display on Radar Set AN/FPN-40; 011-151-4008, Adjust IFF Display on Radar Set AN/FPN-40.

*****IMPORTANT NOTICE*****

THE PASSING SCORE FOR ALL ACCP MATERIAL IS NOW 70%.

PLEASE DISREGARD ALL REFERENCES TO THE 75% REQUIREMENT.

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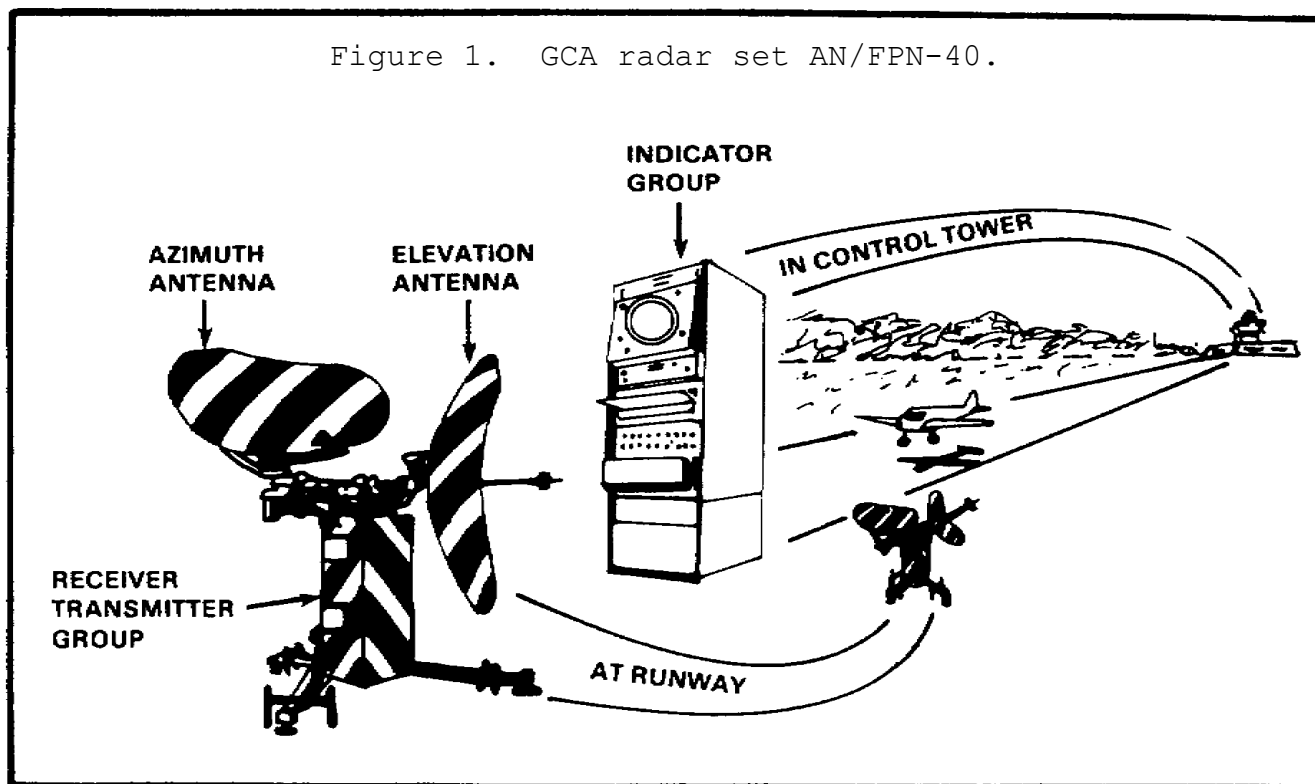
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INTRODUCTION

1. This subcourse consists of one lesson, divided into four learning events, designed to provide you with the skills and knowledge necessary to align and adjust the radar set AN/FPN-40. The four learning events are Adjust the Precision Display, Adjust the PPI Delay Control, Adjust PPI Display, and Adjust IFF Display.

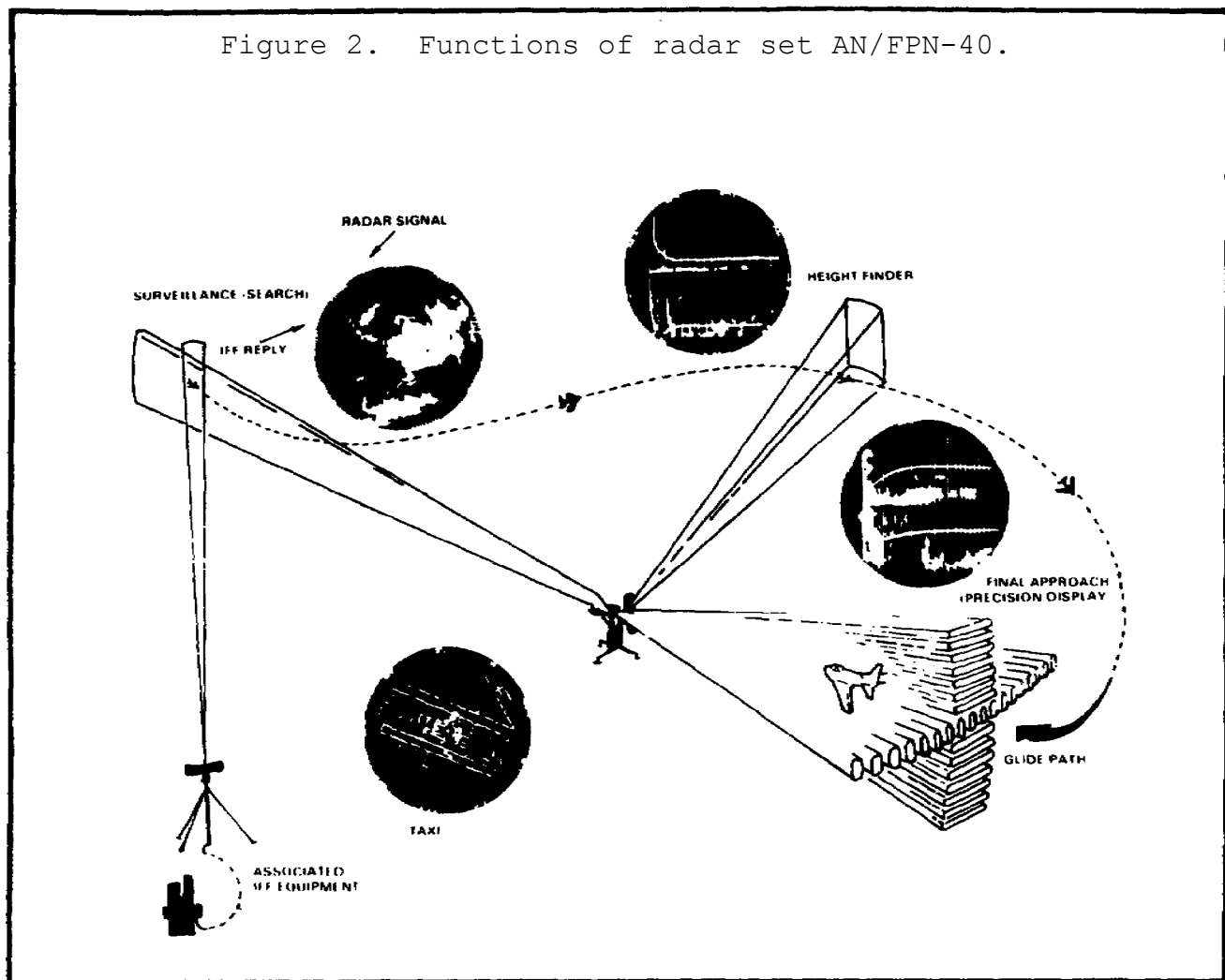
2. Radar set AN/FPN-40 is a lightweight radar set that can be transported by truck or helicopter. The AN/FPN-40 operates in the 9000 to 9160 MHz frequency range (Figure 1).

Figure 1. GCA radar set AN/FPN-40.



3. The radar set AN/FPN-40 has four separate functions: surveillance, height finder, final approach, and taxi (Figure 2).

Figure 2. Functions of radar set AN/FPN-40.



a. The surveillance function detects small aircraft within a radius of 25 miles and large aircraft within a radius of 40 miles.

b. The height finder function determines the height of an aircraft if the aircraft is within 30 miles of the airfield and between 500 and 50,000 feet in altitude.

c. The final approach function guides the aircraft along the proper glide path and course line to the touchdown point.

d. The taxi function gives a plain view of the airfield runways and taxi strips. This permits the operator to control ground traffic.

4. All procedures for performing these tasks are taken from the applicable technical manual on this piece of equipment.
5. This package presents the training material in a more detailed form in order to assist the beginning repairer.

LESSON

ADJUSTMENT OF PPI, IFF, AND PRECISION DISPLAY, AND PPI DELAY CONTROL

TASK

Describe the function and use of components used in the adjustment and operation of the precision display. Provide skills and knowledge necessary to adjust the planned position indicator (PPI) delay control and the PPI display. Describe the procedures used to adjust the identify friend or foe (IFF) display.

CONDITION

Performance-Oriented. Given this subcourse, pencil, and paper.

STANDARD

Performance-Oriented. Demonstrate competency of task skills and knowledge by correctly responding to 75 percent of the multiple-choice test questions covering radar set AN/FPN-40.

Learning Event 1:

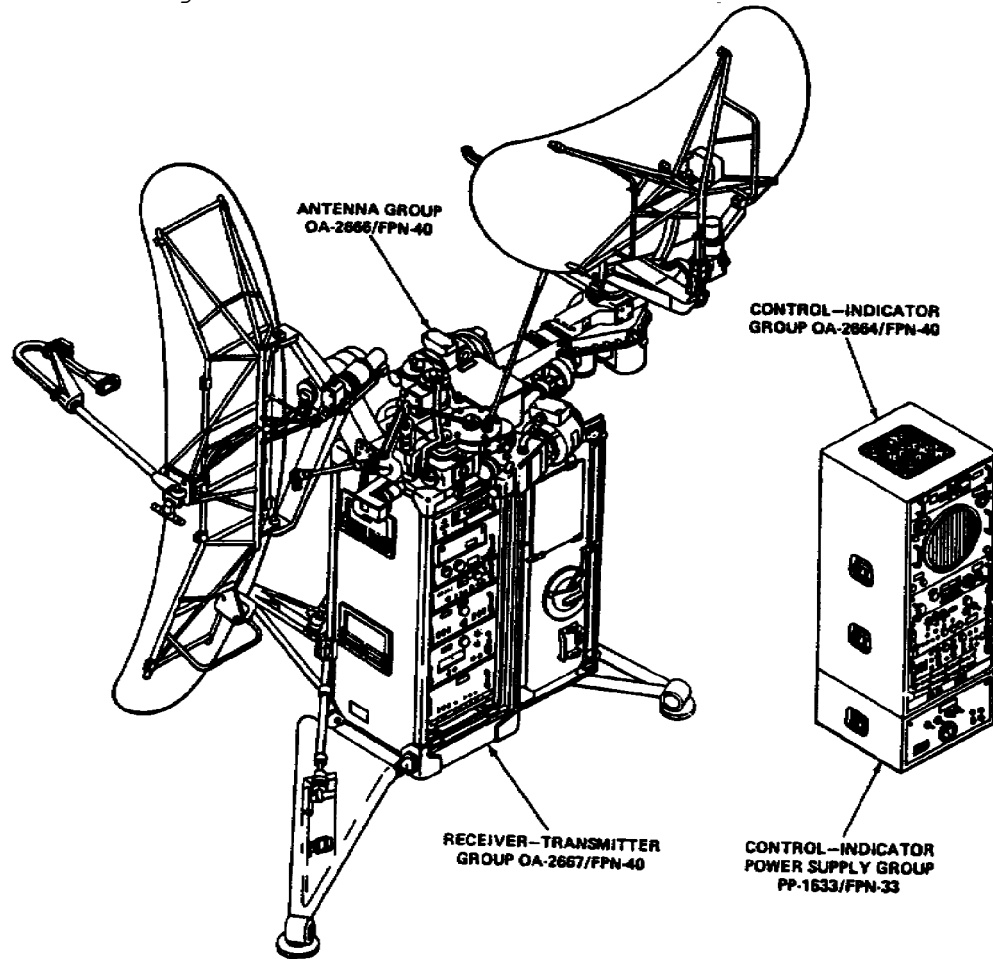
ADJUST THE PRECISION DISPLAY

1. Learning Event 1 will enable you to locate and identify precision display adjustment controls, and components of the control indicator group OA-2664/FPN-40 as well as interpret information displayed on the cathode ray tube (CRT) of radar set AN/FPN-40.

2. Location and initial settings of components and controls are given below.

a. Locate the control indicator group OA-2664/FPN-40 on radar set AN/FPN-40 (Figure 3).

Figure 3. Radar set AN/FPN-40.

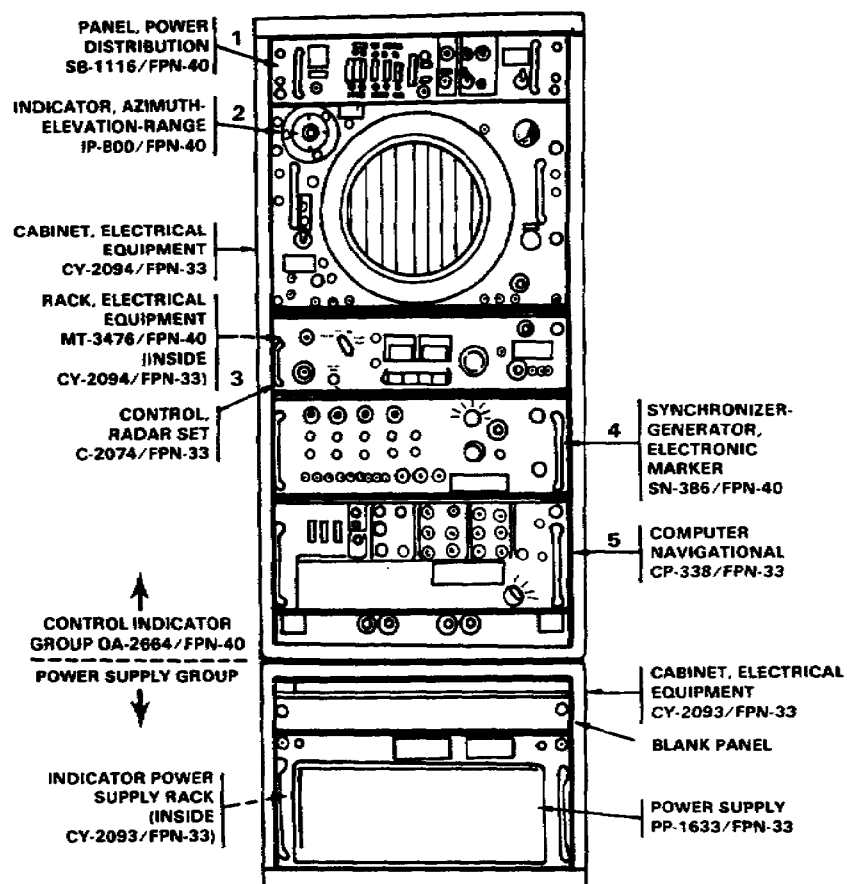


b. Locate the following drawers on control indicator group OA-2664/FPN-40 (Figure 4).

- (1) Panel, power distribution SB-1116/FPN-40.
- (2) Indicator, azimuth-elevation range IP-800/FPN-40.

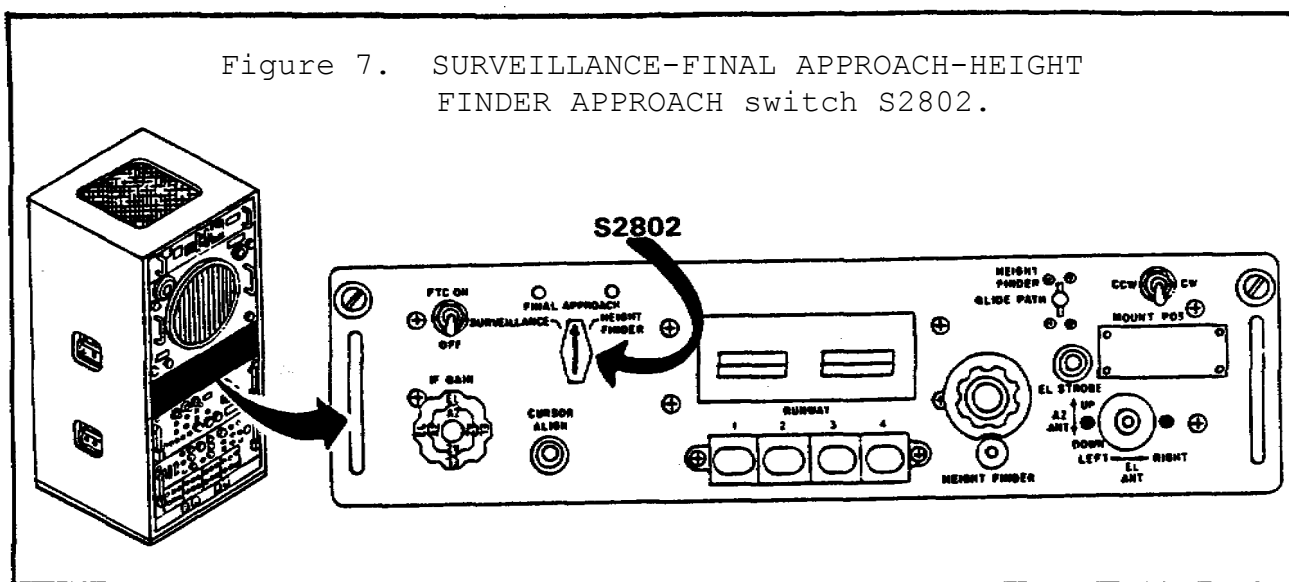
- (3) Control, radar set C-2074/FPN-33.
- (4) Synchronizer-generator SN-386/FPN-40.
- (5) Computer, navigational CP-338/FPN-33.

Figure 4. Control indicator group OA-2664/FPN-40.



c. Locate the SCAN switch S305 on panel, power distribution SB-1116/FPN-40 (Figure 5).

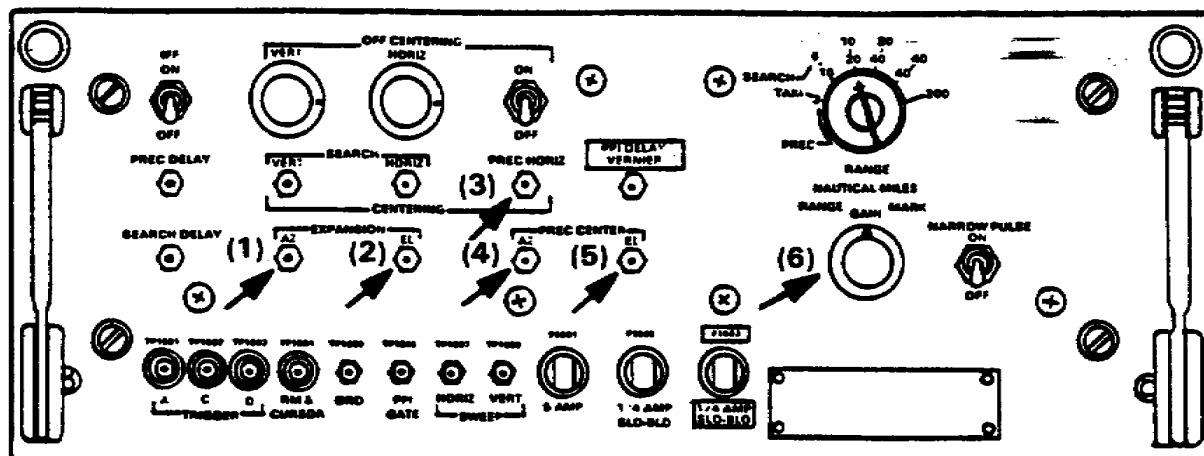
e. Locate the SURVEILLANCE-FINAL APPROACH-HEIGHT FINDER switch S2802 on control, radar set C-2074/FPN-40 (Figure 7).



f. Locate the following on synchronizer-generator, electronic marker SN-386/FPN-40 (Figure 8).

- (1) EXPANSION AZ control R1510.
- (2) EXPANSION EL control R1509.
- (3) PRECISION HORIZONTAL CENTERING control R1506.
- (4) PRECISION CENTER AZ control R1507.
- (5) PRECISION CENTER EL control R1508.
- (6) RANGE, NAUTICAL MILES switch S1501.

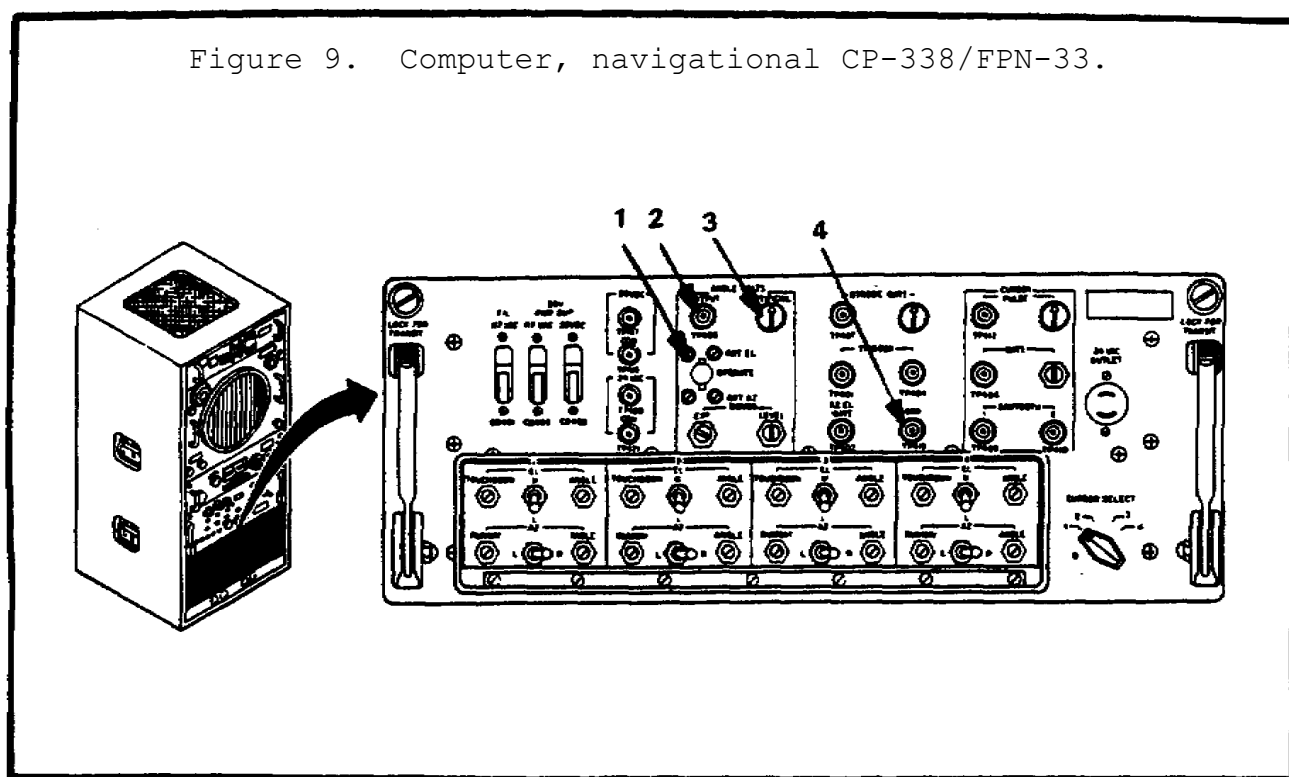
Figure 8. Synchronizer-generator, electronic marker SN-386/FPN-40.



g. Locate the following on computer, navigational CP-338/FPN-33 (Figure 9).

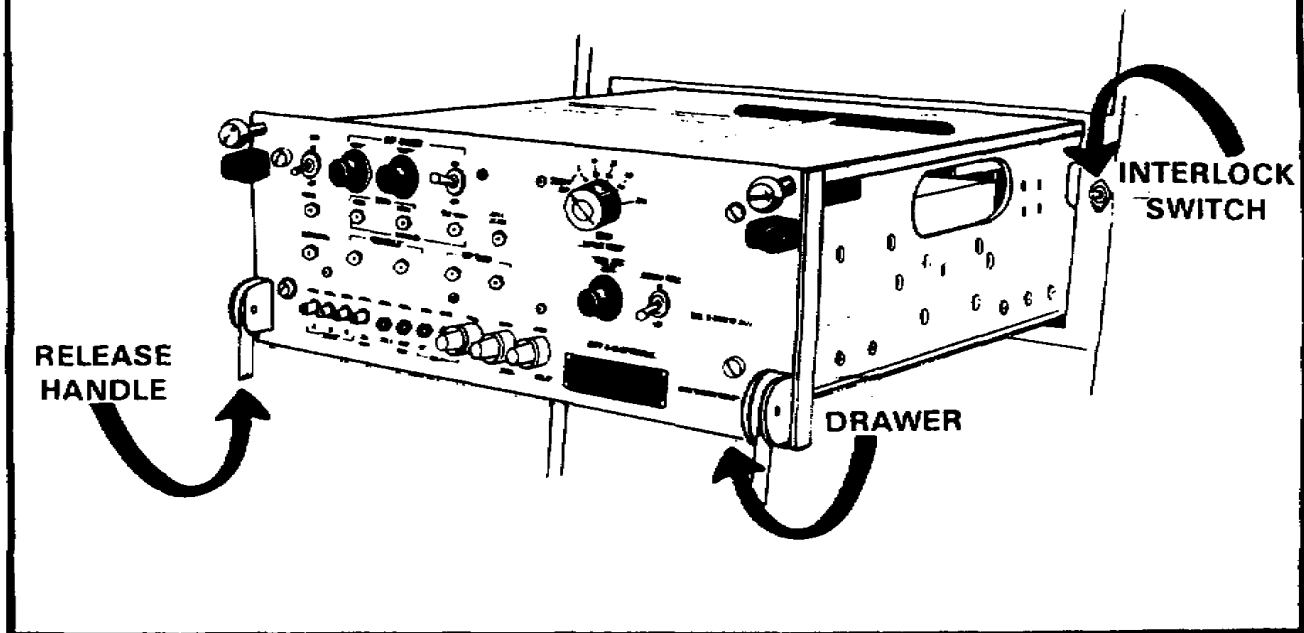
- (1) ART AZ - OPERATE - ART EL switch S401.
- (2) Angle volts output test point TP405.
- (3) ARTIFICIAL ANGLE VOLTS control R402.
- (4) Ground test point TP419.

Figure 9. Computer, navigational CP-338/FPN-33.



h. Disengage the release handles on synchronizer-generator, electronic marker SN-386/FPN-40 and pull the drawer forward. Pull the INTERLOCK switch out to restore power (Figure 10).

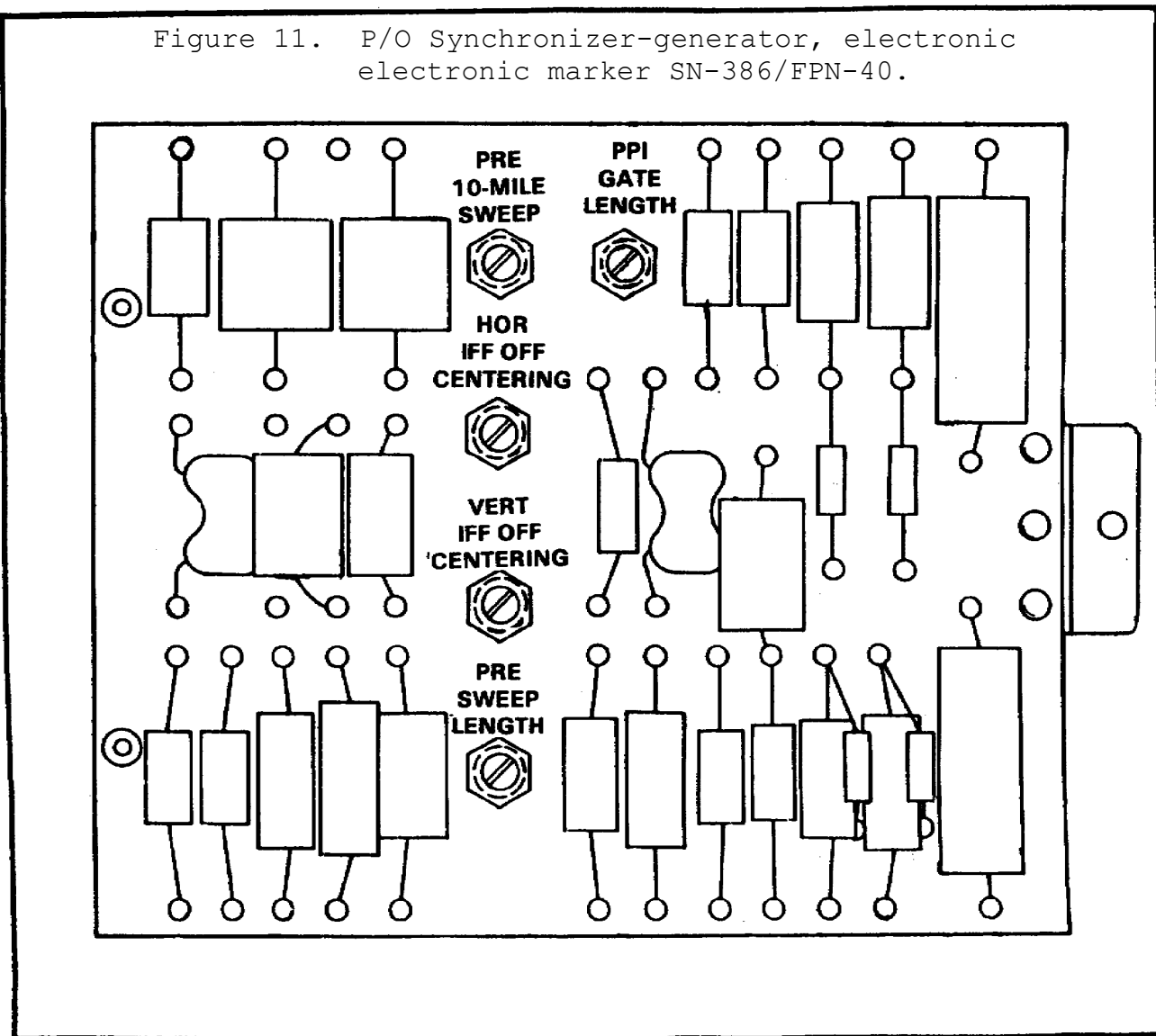
Figure 10. Synchronizer-generator, electronic marker SN-386/FPN-40.



NOTE: An INTERLOCK serves as an OFF-ON switch. Because of its design, the INTERLOCK provides additional functions. First, it removes the power from the unit when an operator opens a panel or drawer. This provides safety for the operator. Secondly, when testing is required by the repair person, it restores power to the unit when placed in its most forward position.

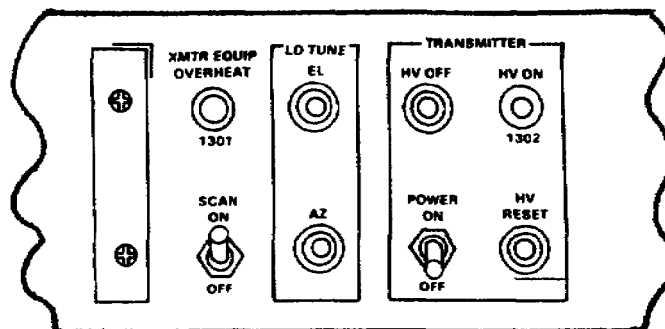
i. Locate the PREC 10-MILE SWEEP control R1523 and PREC SWEEP LENGTH control R1516 on top of synchronizer-generator, electronic marker SN-386/FPN-40 (Figure 11).

Figure 11. P/O Synchronizer-generator, electronic
electronic marker SN-386/FPN-40.



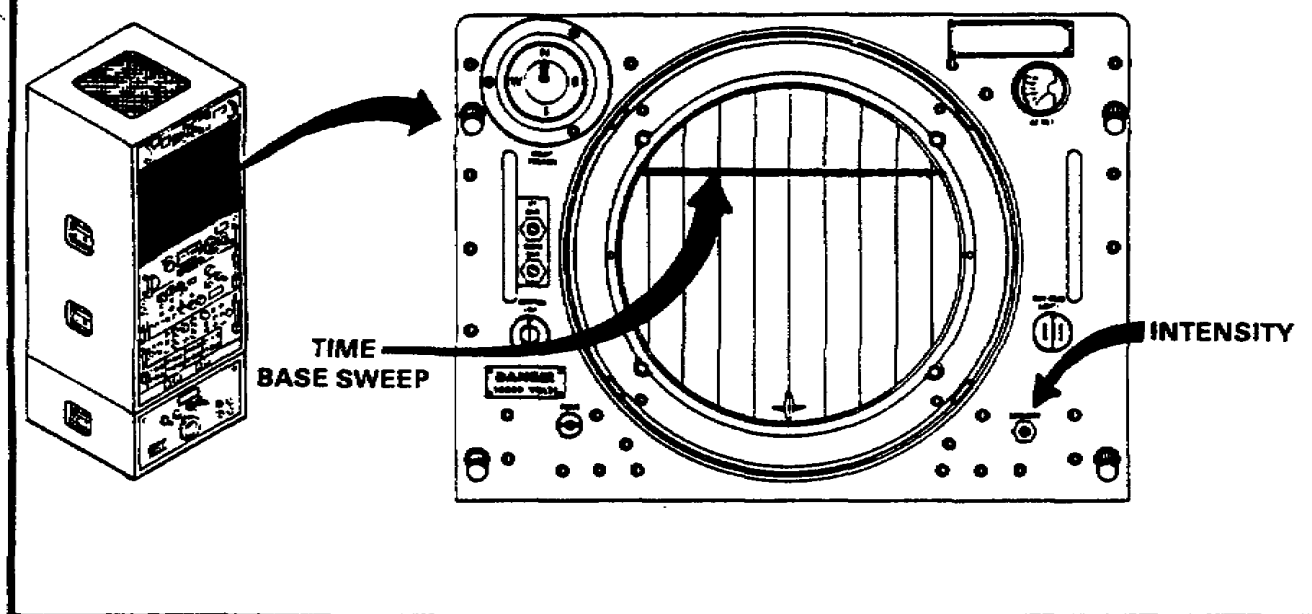
j. Place SCAN switch S305 on panel, power distribution SB-1116/FPN-40 to the ON position (Figure 12).

Figure 12. P/O panel, power distribution
SB-1116/FPN-40.



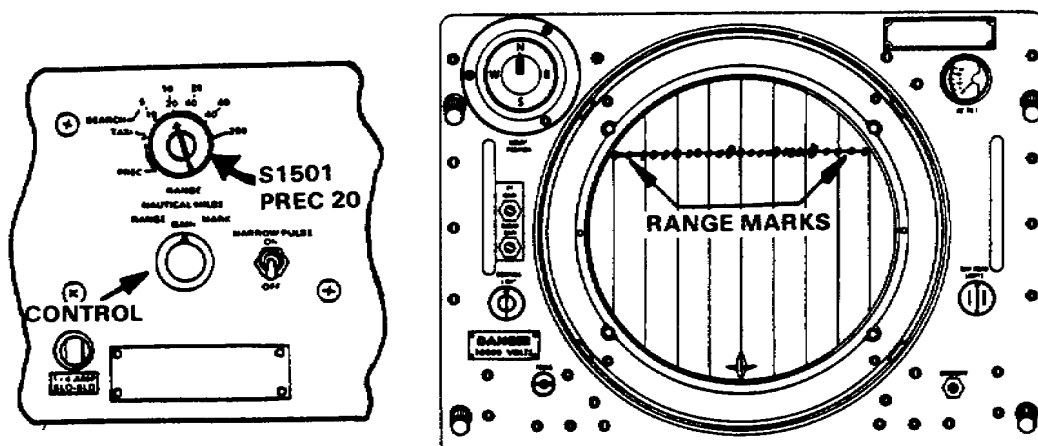
k. Rotate the INTENSITY control (Figure 13) clockwise on indicator, azimuth-elevation range IP-800/FPN-40 until a time base sweep appears.

Figure 13. Indicator, azimuth-elevation range IP-800/FPN-40.



1. Turn the RANGE MARK GAIN control R1512 (Figure 14) on SN-386/FPN-40 until intensified dots (called range marks) appear on the time base sweep.

Figure 14. SN-38/FPN-40 and IP-800/FPN-40.

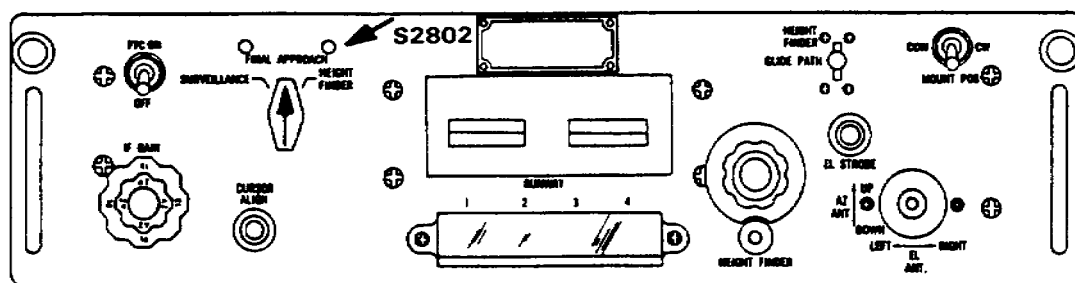


Part of
SN-386/FPN-40

Part of
IP-800/FPN-40

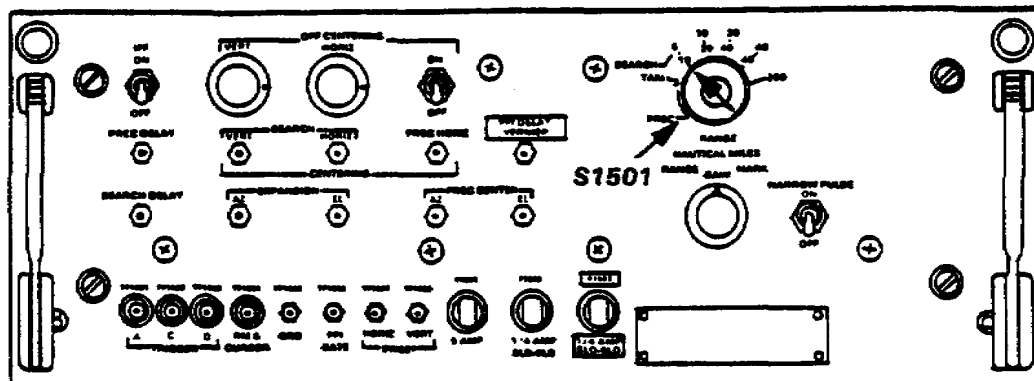
m. Place the SURVEILLANCE-FINAL APPROACH-HEIGHT FINDER switch S2802 (Figure 15) on control, radar set C-2074/FPN-40 to the FINAL APPROACH position.

Figure 15. C-2074/FPN-40.



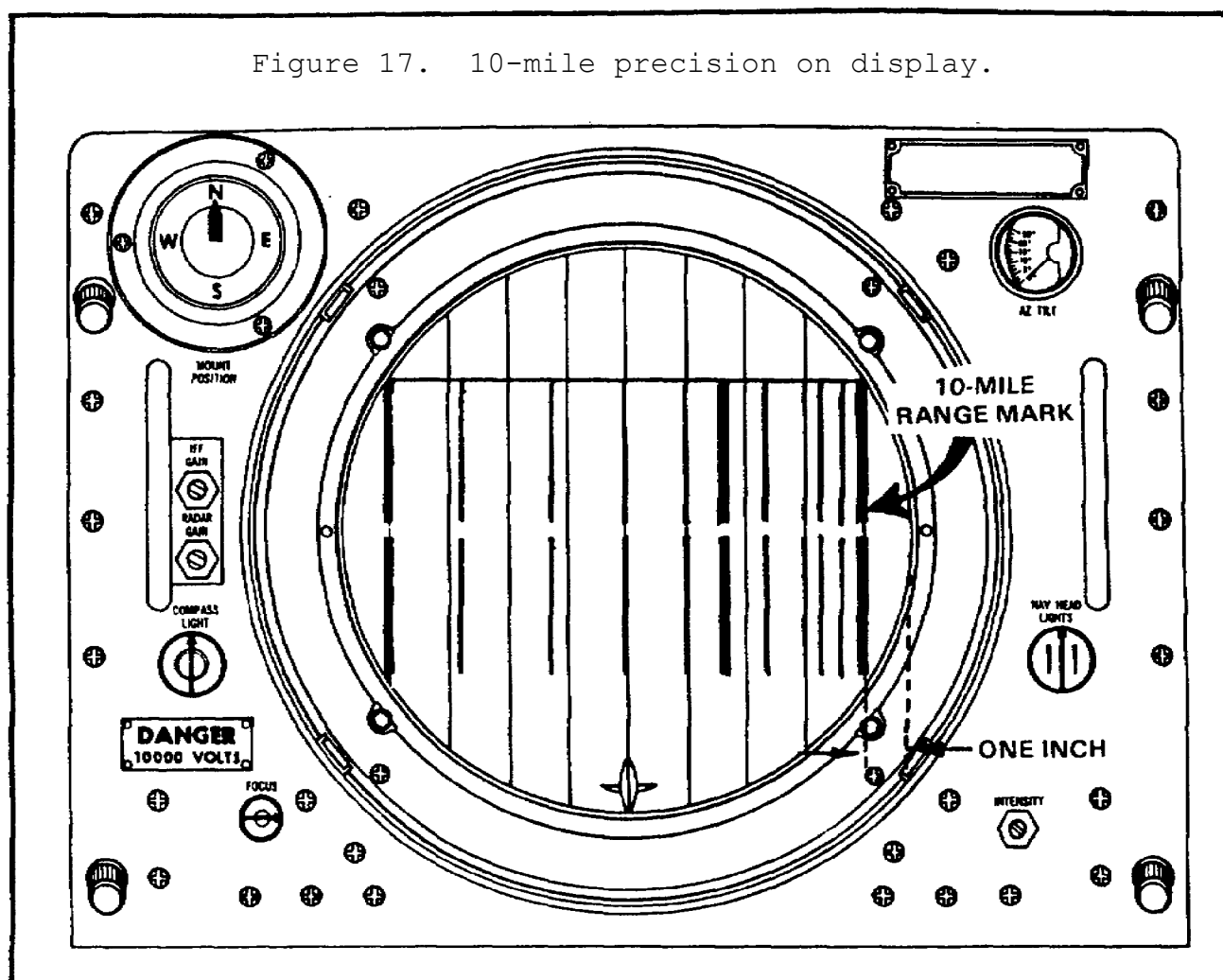
n. Place the RANGE NAUTICAL MILES switch S1501 (Figure 16) on SN-386/FPN-40 to PREC 10.

Figure 16. SN-386/FPN-40.



o. Figure 17 depicts a properly aligned precision display in the 10-mile range.

Figure 17. 10-mile precision on display.



p. The start of the time base sweep (left edge of the time base sweep) is positioned approximately 1 inch from the left edge of the CRT.

q. On SN-386/FPN-40, when the PRECISION HORIZONTAL CENTERING control R1506 (Figure 18) is rotated clockwise or counterclockwise, the time base sweep will move right or left.

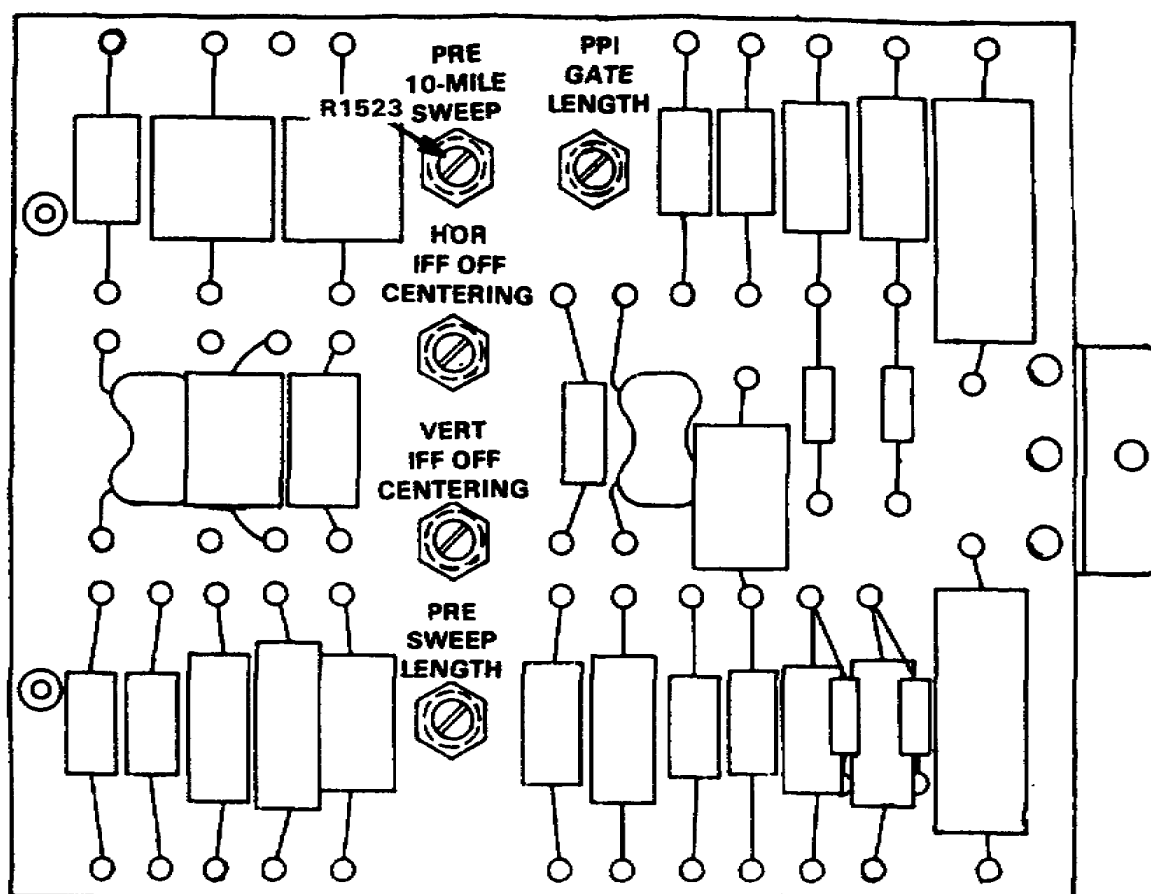
r. Adjust R1506 slightly clockwise and counterclockwise while observing the precision display on the radar set CRT.

s. On the precision display in the 10-mile range, there are 11 intensified vertical lines. The eleventh intensified line is the 10-mile range mark. This range mark is positioned approximately 1 inch from the right edge of the CRT (Figure 17).

t. When the PREC 10-MILE SWEEP control R1523 is adjusted clockwise or counterclockwise, the right edge of the time base sweep will move right or left.

u. Rotate 1523 (Figure 18) on top of SN-386/FPN-40 slightly clockwise and counterclockwise while observing the precision display on the radar CRT.

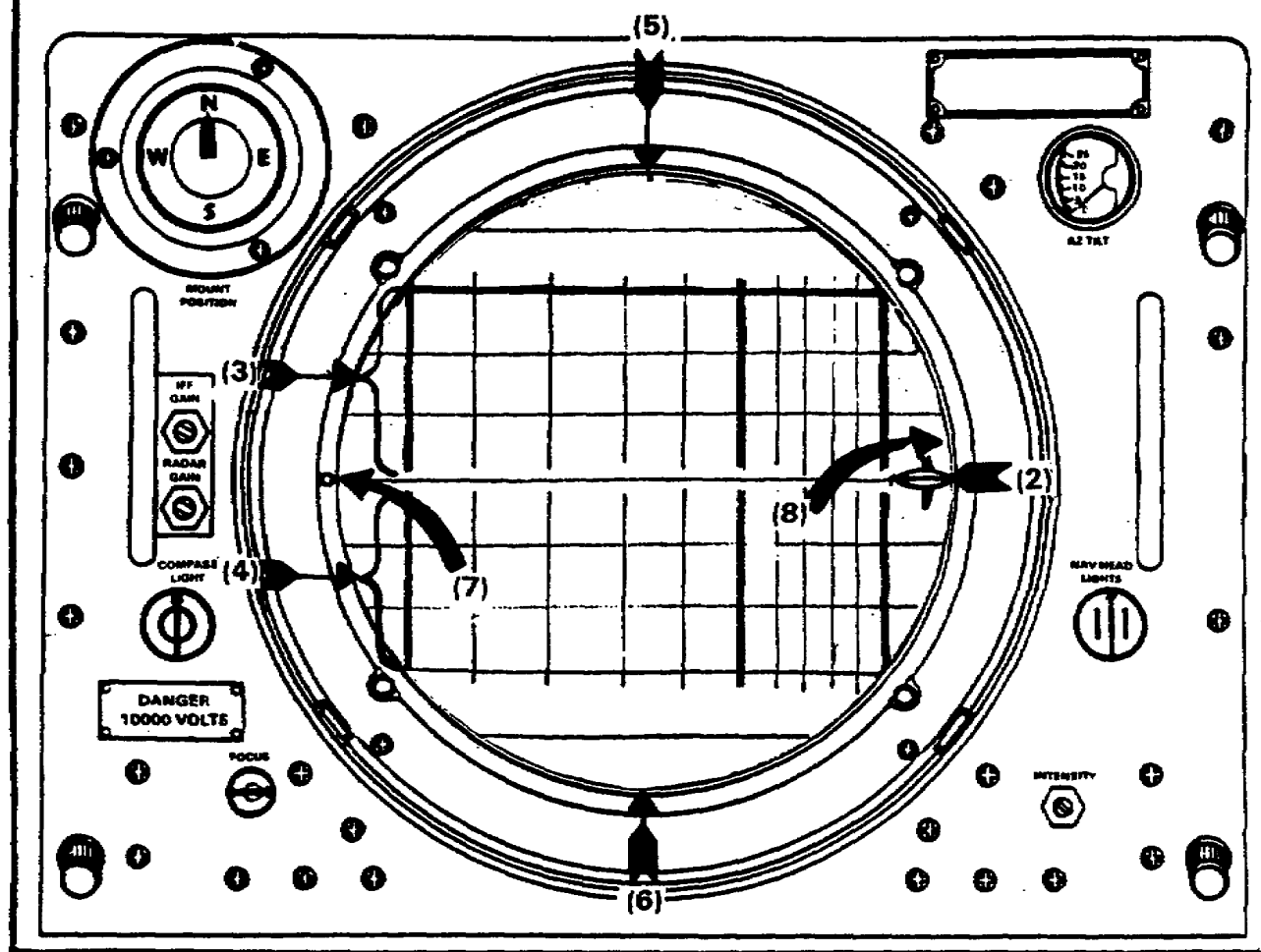
Figure 18. SN-386/FPN-40 (top view).



v. Locate the following on the IP-800/FPN-40 (Figure 19).

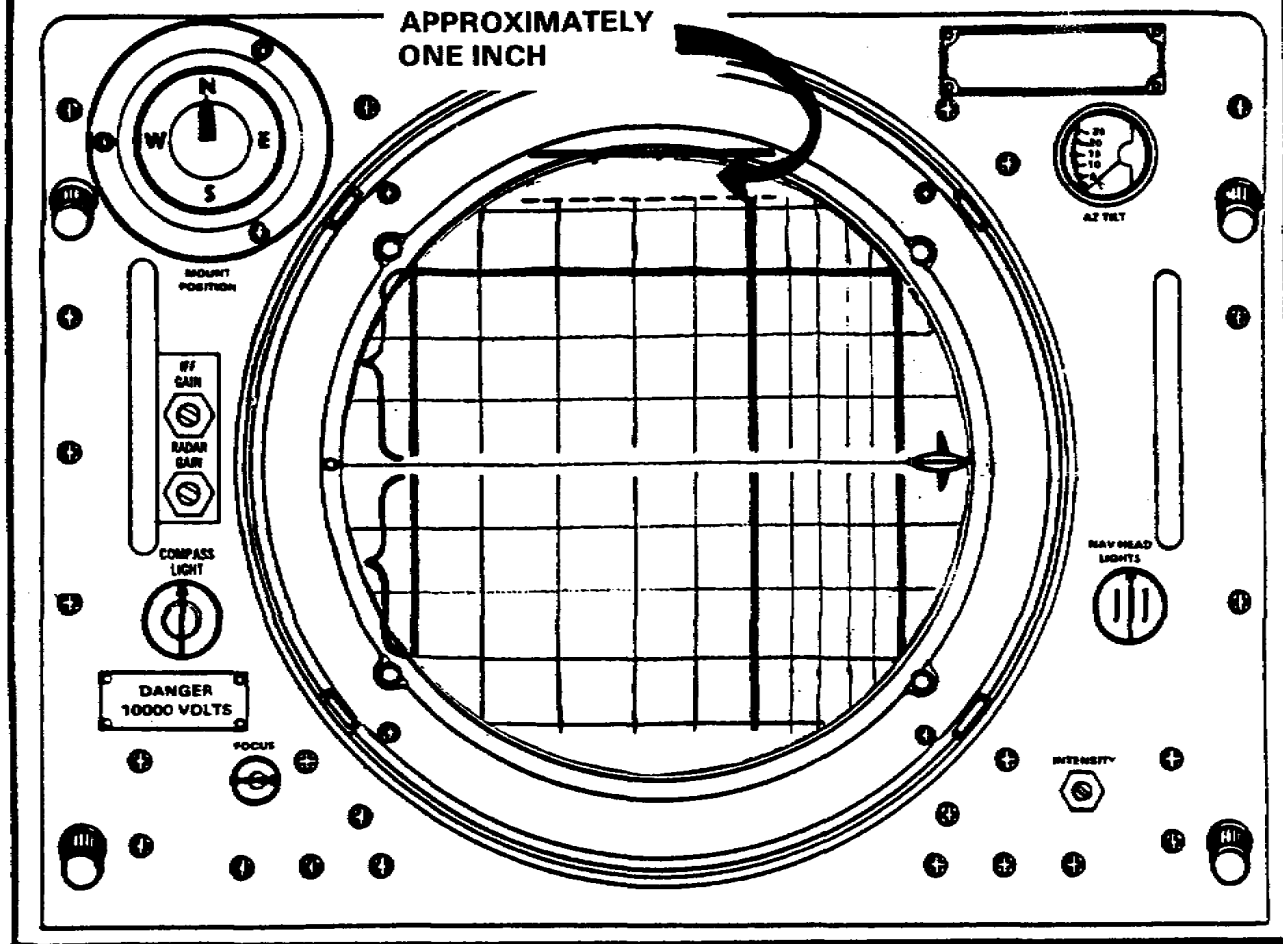
- (1) Grid lines (Figure 6).
- (2) Center grid line.
- (3) Elevation display.
- (4) Azimuth display.
- (5) Top edge of CRT.
- (6) Bottom edge of CRT.
- (7) Left edge of CRT.
- (8) Right edge of CRT.

Figure 19. Indicator AZ-EL range IP-800/FPN-40.



w. On the precision display of the radar CRT, the upper rectangle portion is the elevation display. Proper adjustment of the expansion EL control R1509 will place the top of the elevation portion of the precision display approximately 1 inch from the top of the CRT (Figure 20).

Figure 20. IP-800/FPN-40.



x. Rotate R1509 (Figure 21) on SN-386/FPN-40 slightly clockwise and counterclockwise while observing the elevation portion of the precision display.

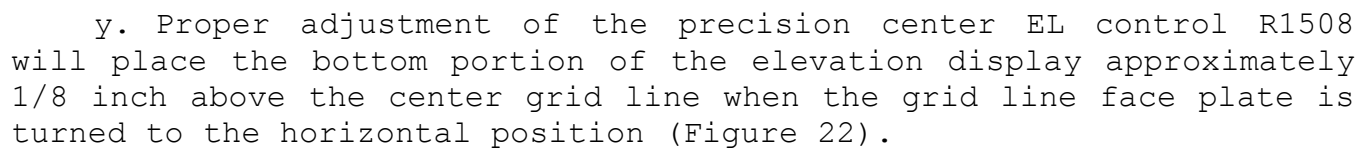
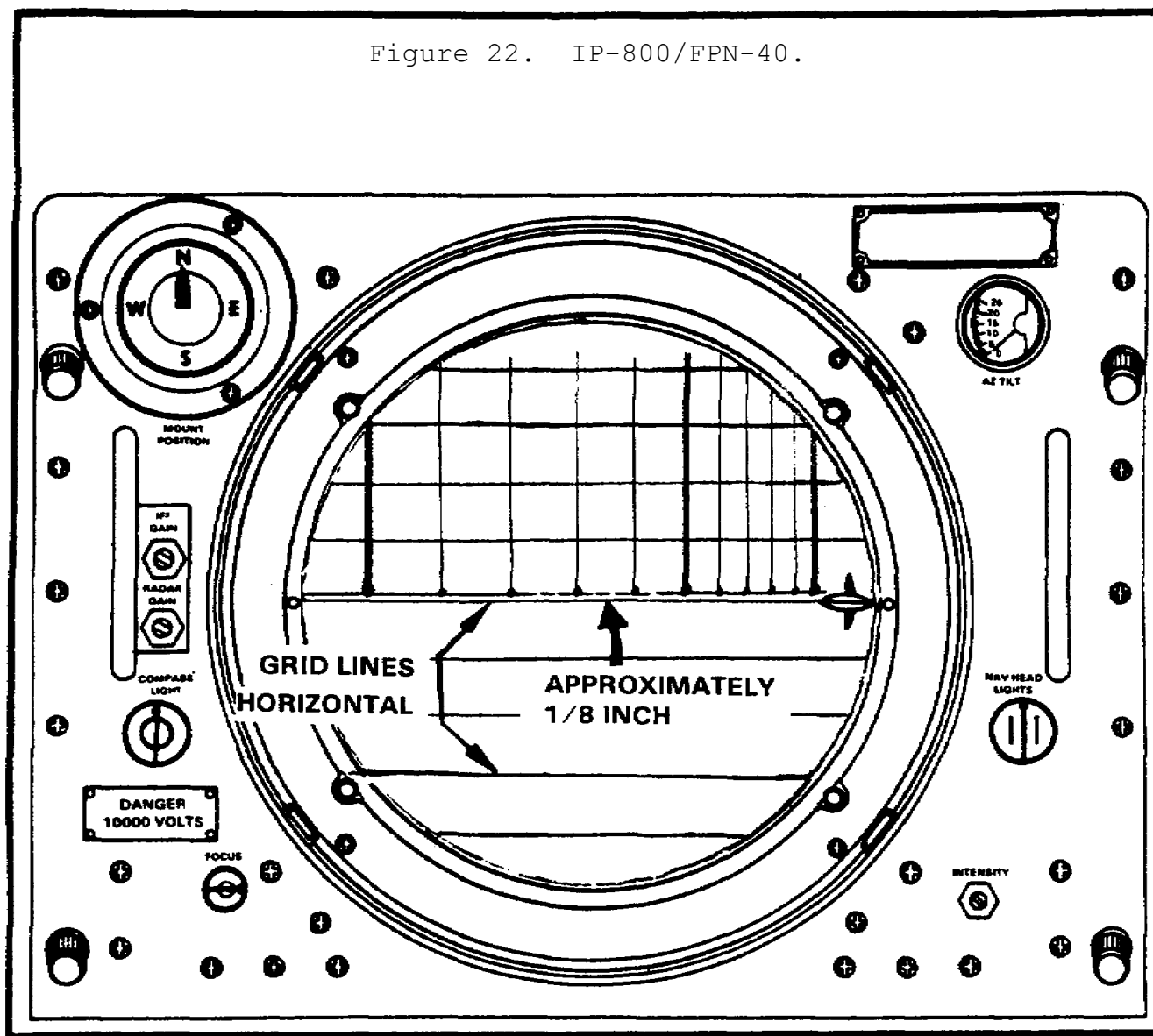
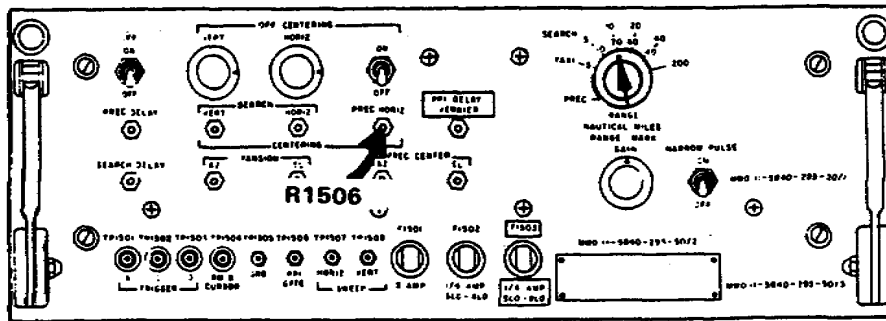


Figure 22. IP-800/FPN-40.



z. Rotate R1508 (Figure 23) on SN-386/FPN-40 slightly clockwise and counterclockwise and observe the precision display.

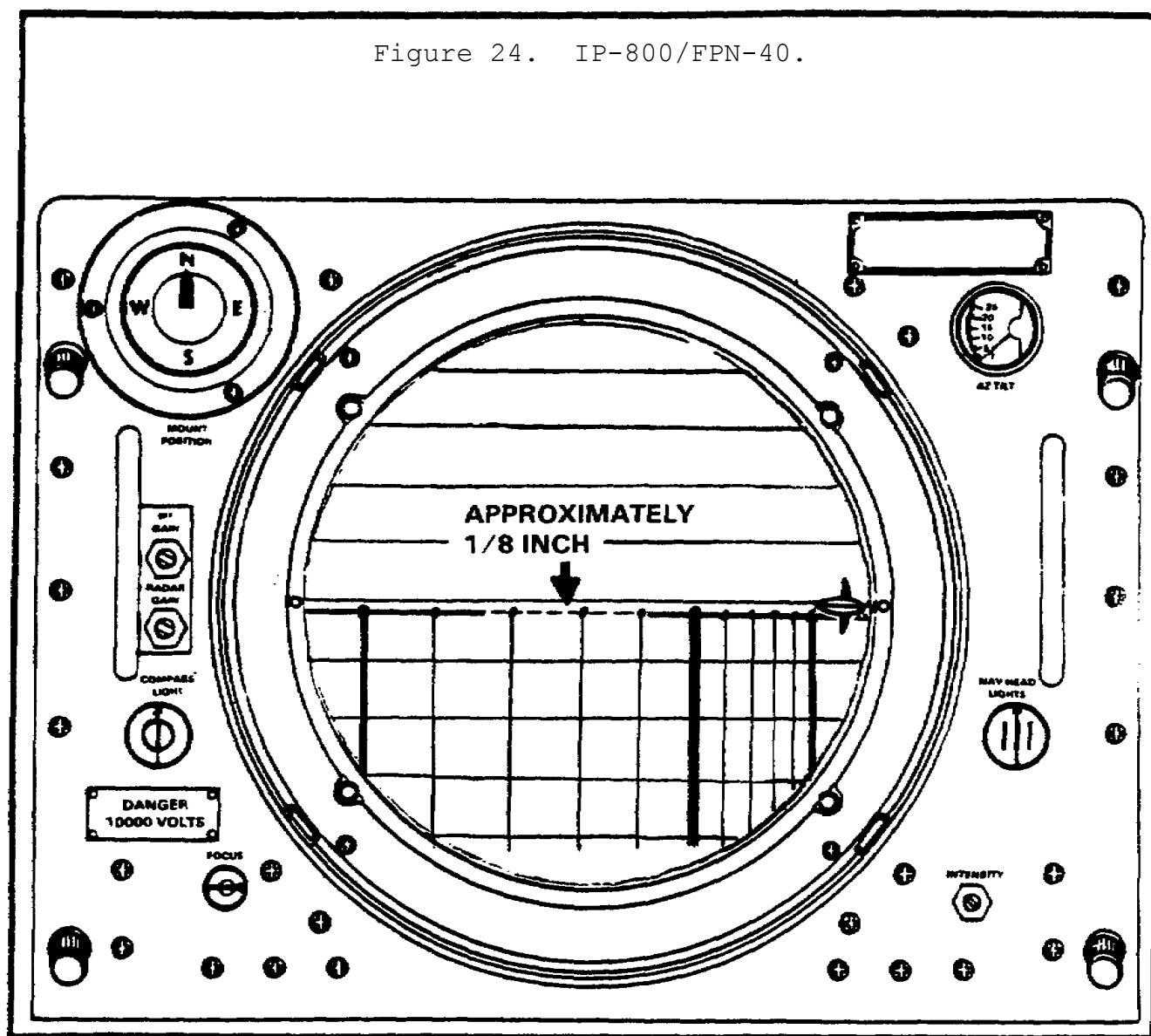
Figure 23. SN-386/FPN-40.



aa. On the precision display of the radar CRT, the lower rectangle is the azimuth display.

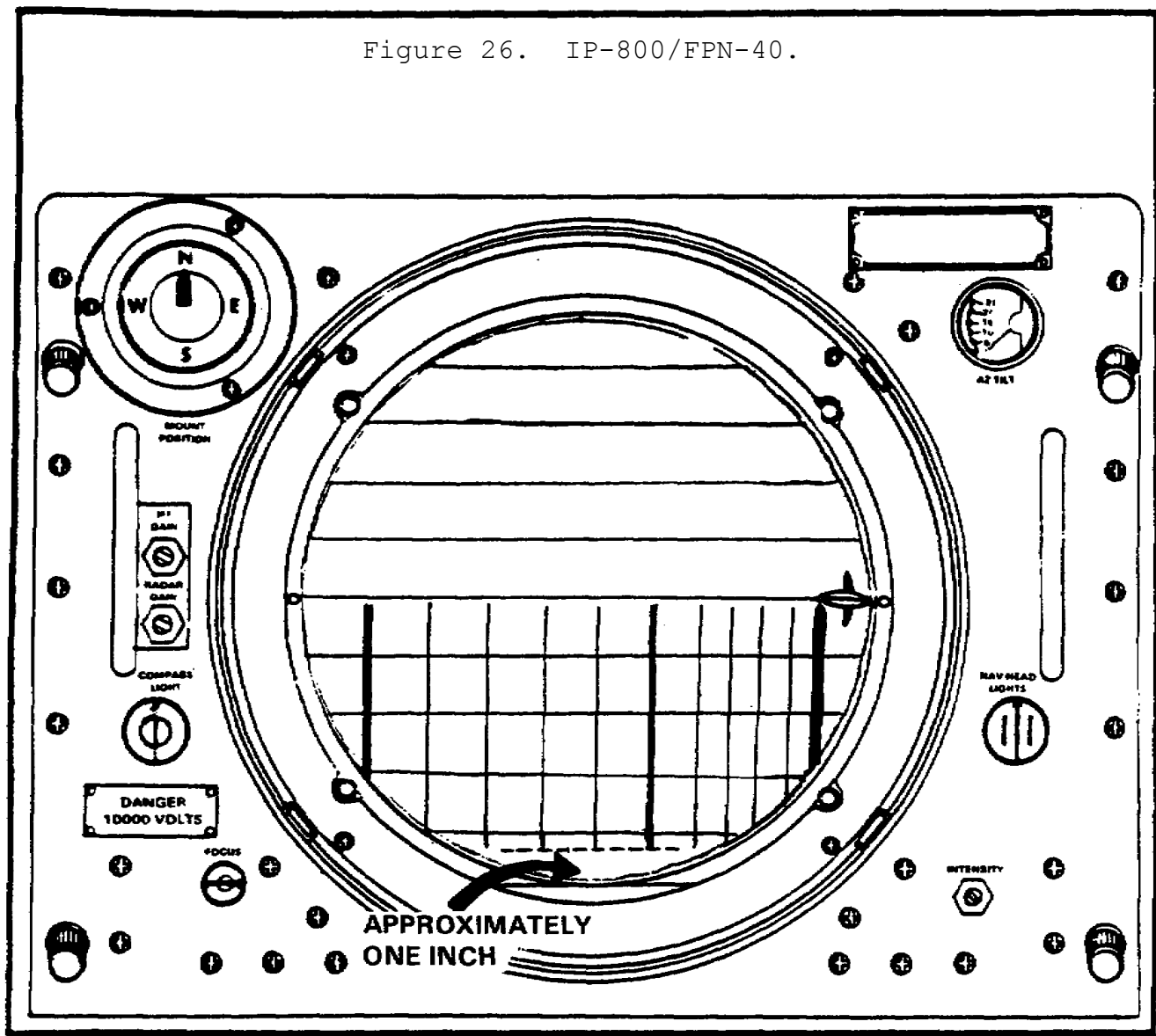
bb. Proper adjustment of the EXPANSION AZ control R1510 will place the top of the azimuth portion of the precision display approximately 1/8 inch below the center grid line of the CRT grid line face plate (Figure 24).

Figure 24. IP-800/FPN-40.

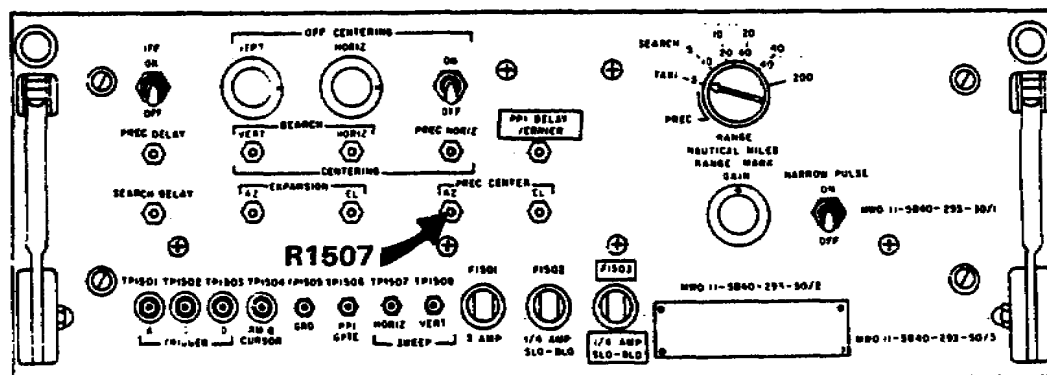


cc. Rotate R1510 (Figure 25) on SN-386/FPN-40 slightly clockwise and counterclockwise while observing the azimuth portion of the precision display.

Figure 26. IP-800/FPN-40.

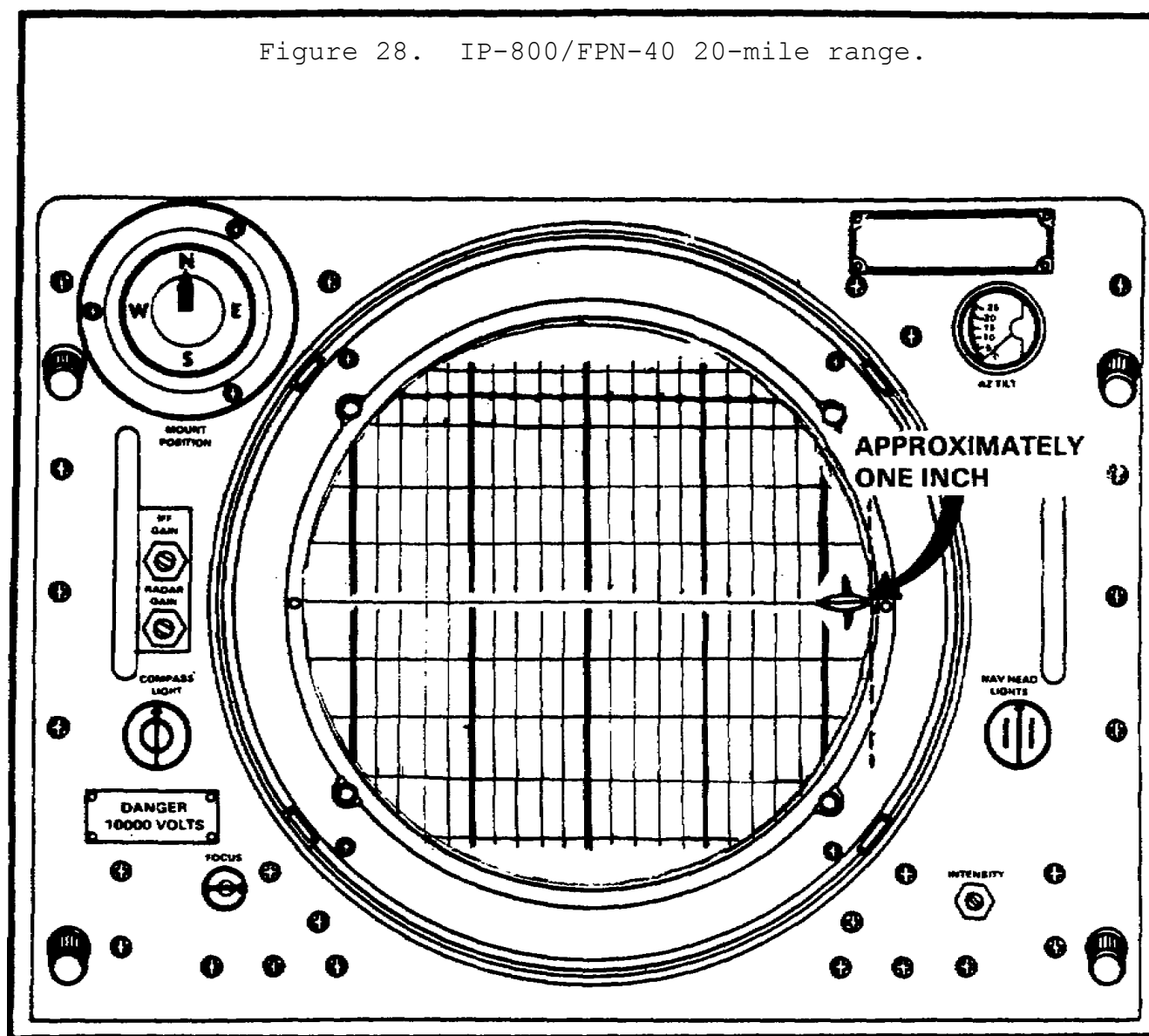


ee. Rotate R1507 (Figure 27) on SN-386/FPN-40 slightly clockwise and counterclockwise while observing the azimuth portion of the precision display.



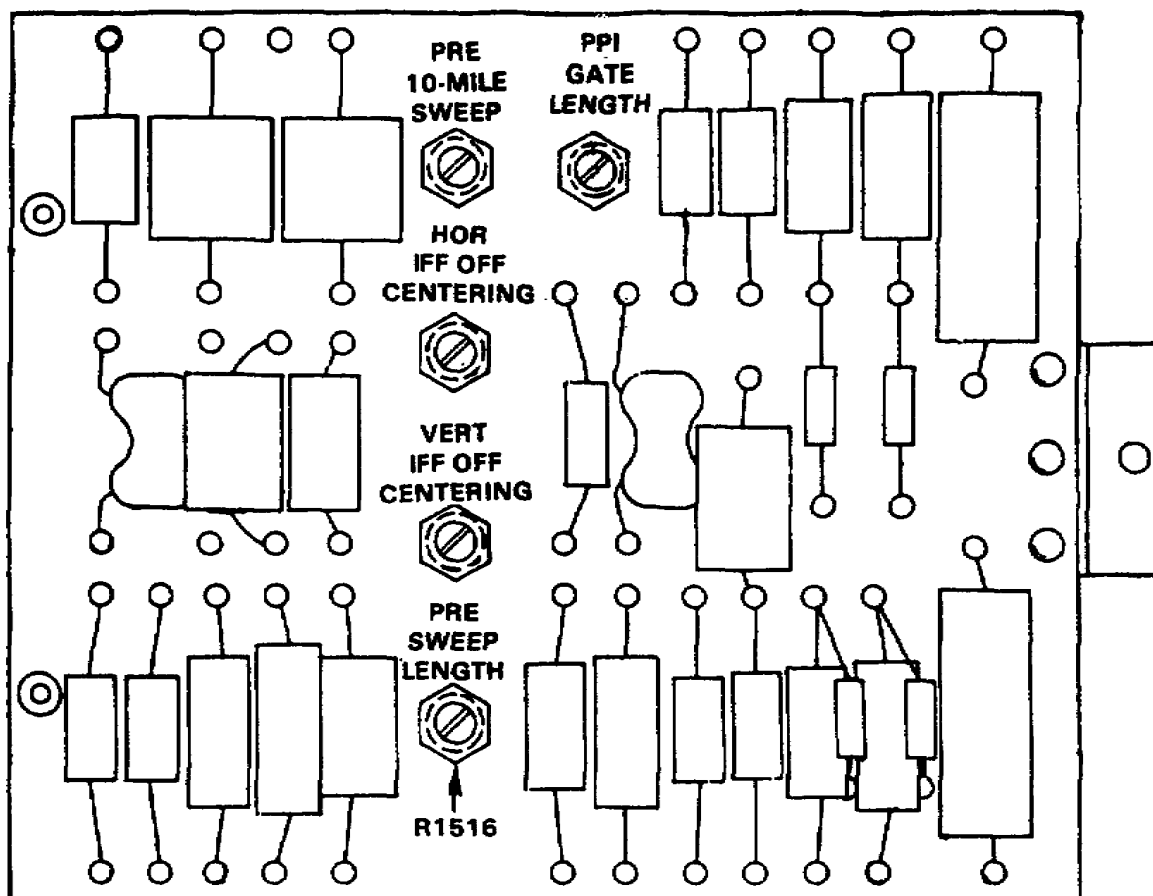
gg. Figure 28 shows the precision display in the 20-mile range. The sweep trace ends approximately 1 inch from the right edge of the CRT.

Figure 28. IP-800/FPN-40 20-mile range.



hh. Adjusting the PRECISION SWEEP LENGTH control R1516 (Figure 29) on part of SN-386/FPN-40 will cause the right edge of the precision display to move left or right.

Figure 29. P/O SN-386/FPN 40.



ii. Rotate R1516 slightly clockwise and counterclockwise while observing the precision display on the radar CRT.

3. If you have access to a radar set AN/FPN-40, adjustment of the precision display is done as follows:

a. Place SCAN switch S305 to ON (Figure 12).

b. Place SURVEILLANCE-FINAL APPROACH-HEIGHT FINDER switch S2802 to the FINAL APPROACH position (Figure 5).

c. Place RANGE NAUTICAL MILES switch S1501 to PREC 20 (Figure 14).

d. Rotate the grid line face plate to the position where the grid lines are vertical (Figure 6).

e. Adjust the PRECISION HORIZONTAL CENTERING control R1506 (Figure 30) to position the start of the precision sweep (left edge of sweep) to correspond with the first grid line from the left (Figure 31).

NOTE: The first grid line from the left is approximately 1 inch from CRT edge.

Figure 30. PRECISION HORIZONTAL CENTERING control R1506.

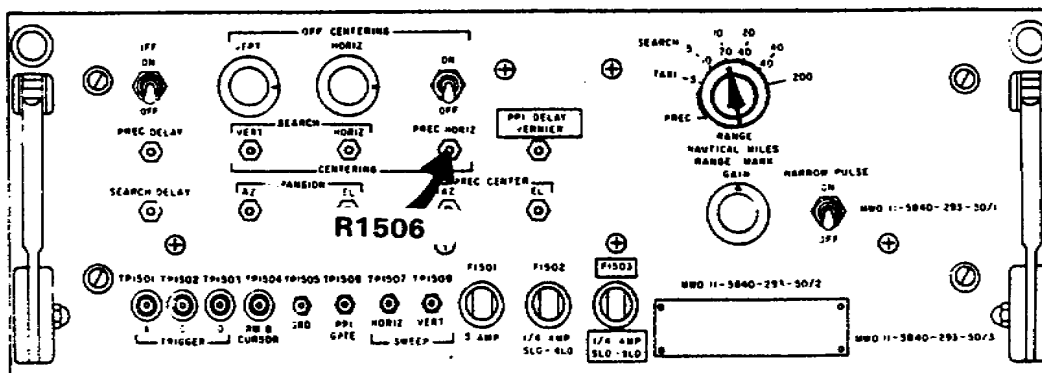
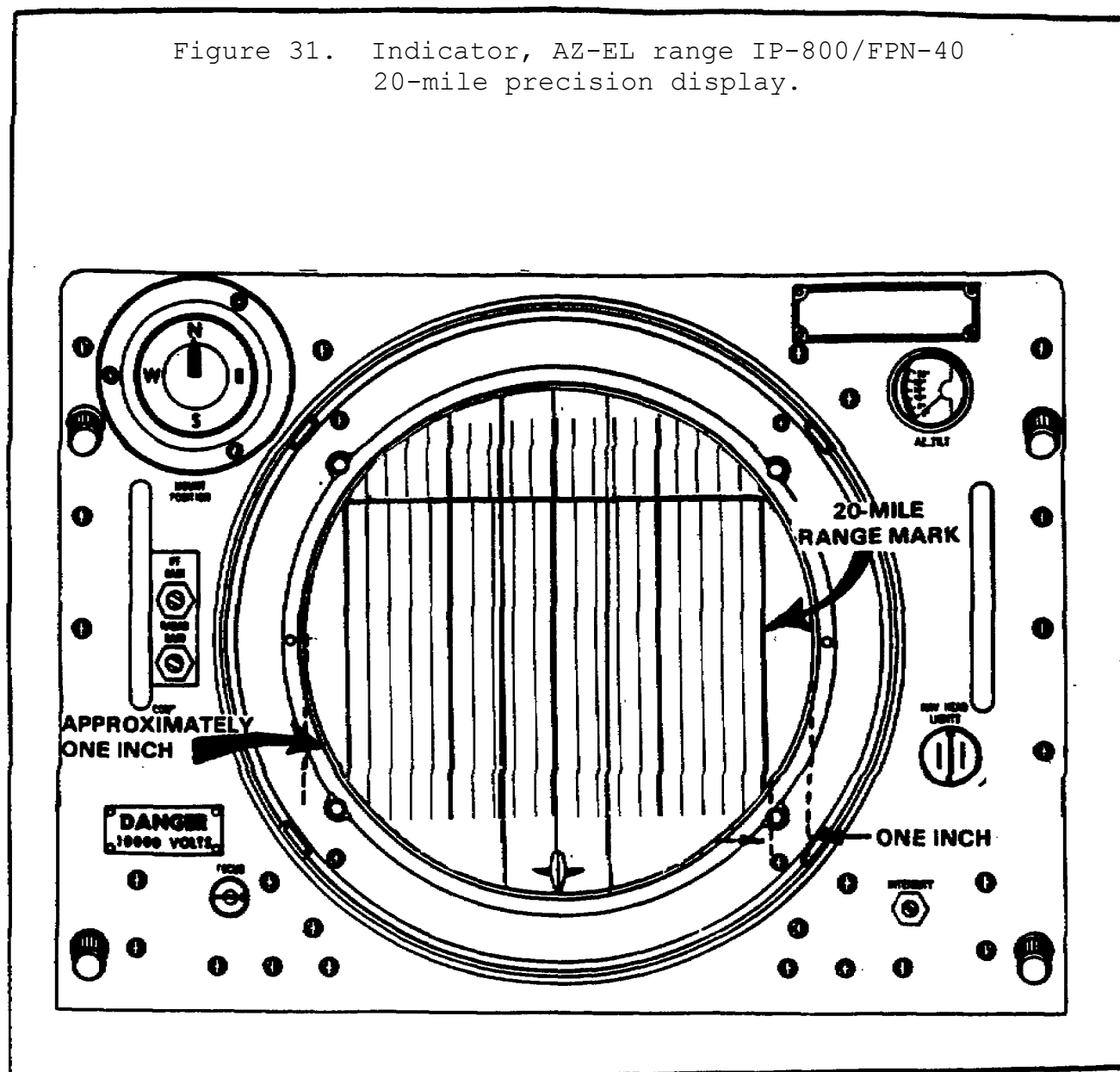


Figure 31. Indicator, AZ-EL range IP-800/FPN-40
20-mile precision display.



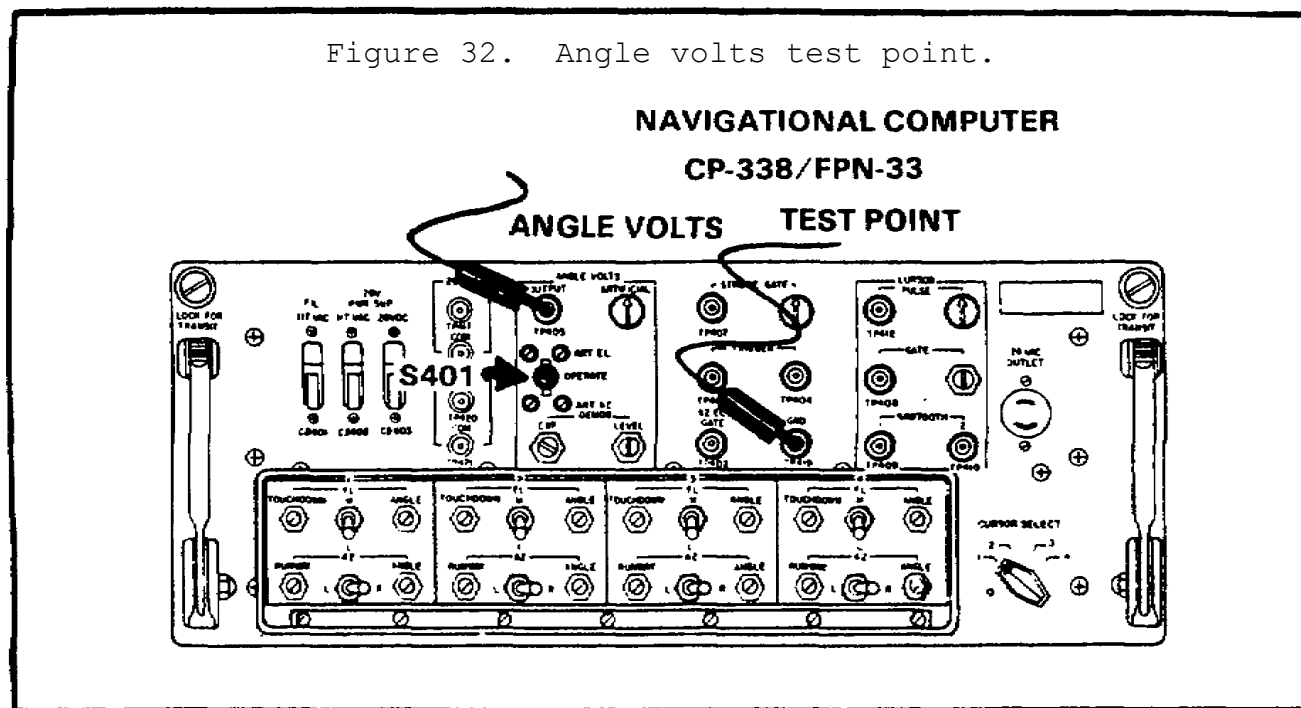
f. Adjust the PRECISION SWEEP LENGTH control R1516 (Figure 29) to position the 20-mile range mark (last intensified line) to correspond with the last grid line on the right (Figure 31).

NOTE: The last grid line to the right is approximately 1 inch from the right edge of the CRT.

g. Rotate the grid line face plate to the position where the grid lines are horizontal (Figure 22).

h. Connect a multimeter, using the DC scale of at least 50 volts, between angle volts output test point TP405 and ground test point TP419 (Figure 32) on CP-338/FPN-33.

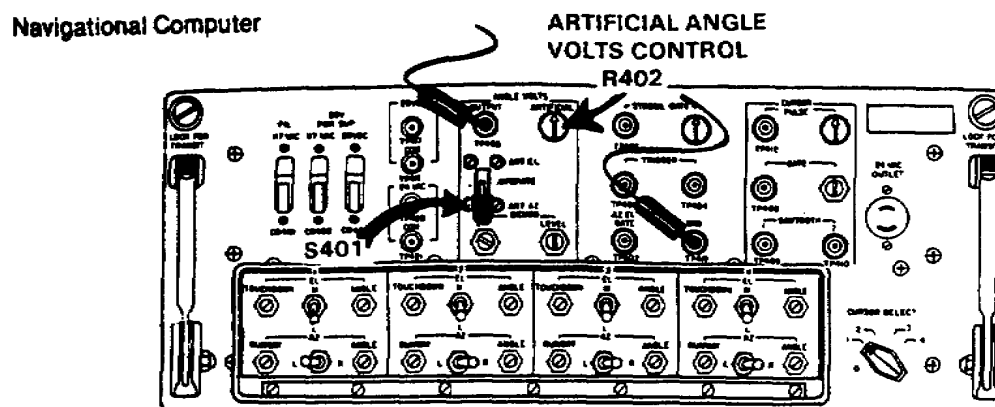
NOTE: TP405 is a POSITIVE voltage.



i. Place the ART AZ-OPERATE-ART EL switch S401 to ART AZ (Figure 33).

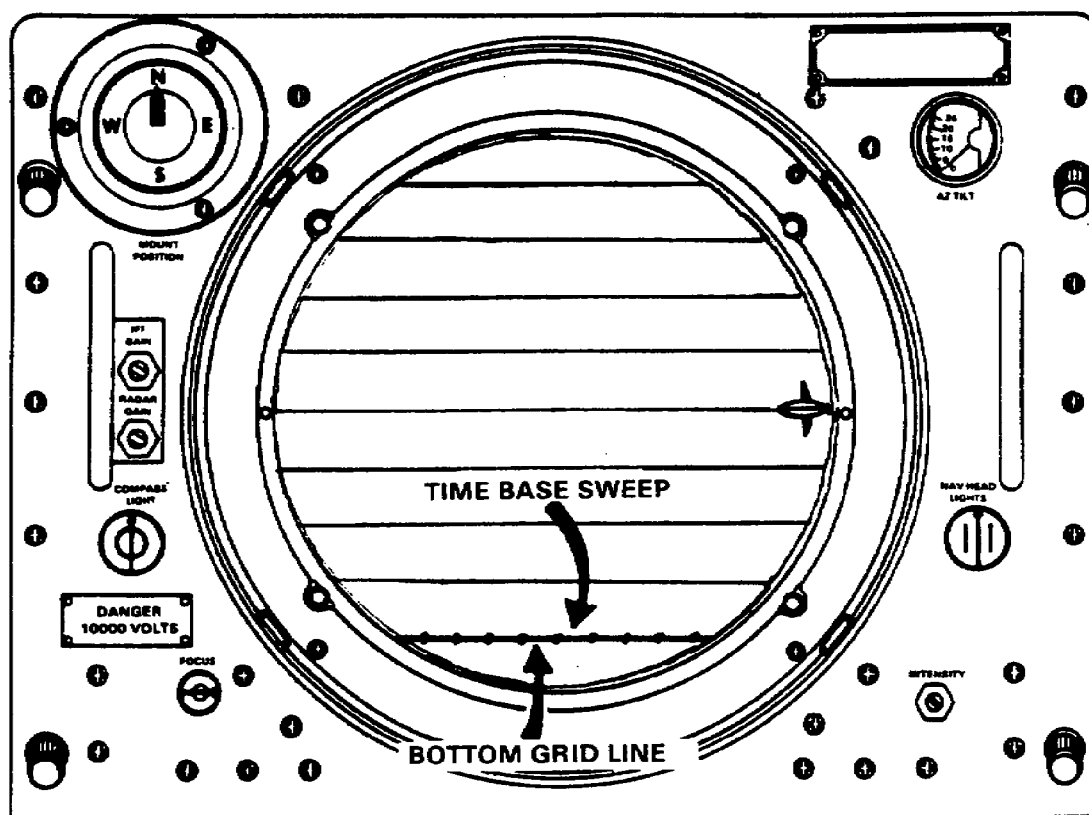
j. Adjust the ARTIFICIAL ANGLE VOLTS control R402 for a 0 volt indication of the multimeter (Figure 33).

Figure 33. Navigational computer, R402 ART ANGLE VOLTS control, S401 ART AZ position.



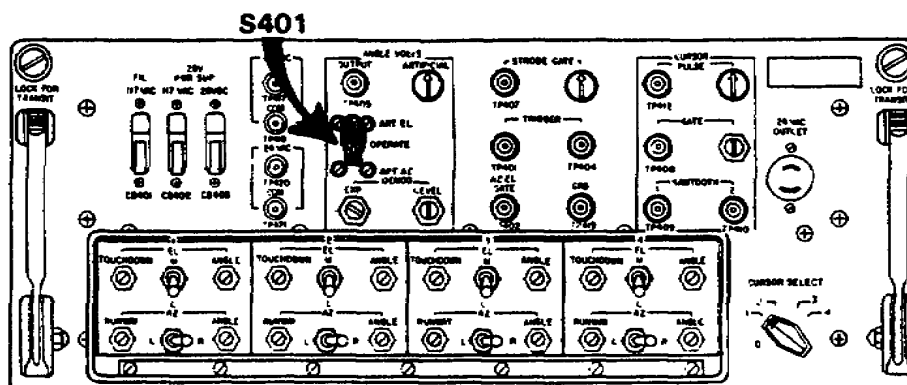
k. Adjust the PRECISION CENTER AZ control R1507 (Figure 27) to position the time base sweep to correspond with the bottom grid line (Figure 34).

Figure 34. Grid line and time base sweep.



1. Place the ART AZ-OPERATE-ART EL switch S401 to ART EL (Figure 35).

Figure 35. S401 ART-EL position.

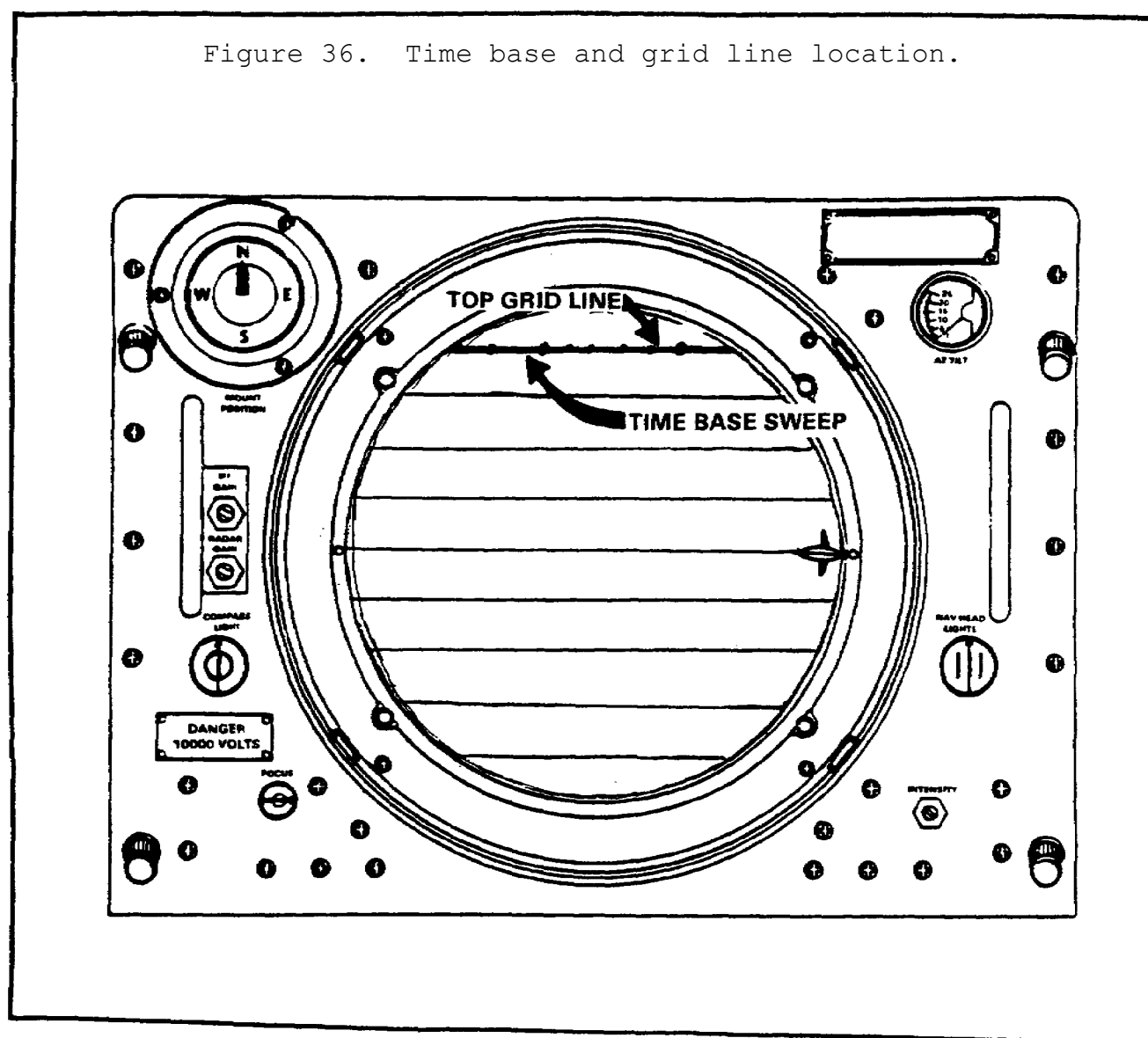


m. Adjust the PRECISION CENTER EL control R1508 (Figure 23) to position the time base sweep approximately 1/8 inch above the center grid line (Figure 22).

n. Adjust the ARTIFICIAL ANGLE VOLTS control R402 (Figure 33) for a +50 volt indication on the multimeter.

o. Adjust the EXPANSION EL control R1509 (Figure 21) to position the time base sweep to correspond with the top grid line (Figure 36).

Figure 36. Time base and grid line location.



p. Place the ART AZ-OPERATE-ART EL switch S401 to ART AZ (Figure 33).

q. Adjust the EXPANSION AZ control R1510 (Figure 25) to position the time base sweep 1/8 inch below the center grid line (Figure 24).

r. Disconnect the multimeter and place the ART AZ-OPERATE-ART EL switch to OPERATE (Figure 32).

s. Rotate the grid line face plate to the position where the grid lines are vertical (Figure 6).

t. Place the RANGE NAUTICAL MILES switch 51501 to PREC 10 (Figure 16).

u. Adjust the PREC 10-MILE SWEEP control R1523 (Figure 18) to position the 10-mile range mark (eleventh intensified line) to correspond with the last grid line on the right (Figure 17).

4. Using this checklist, review the location of the following components and controls.

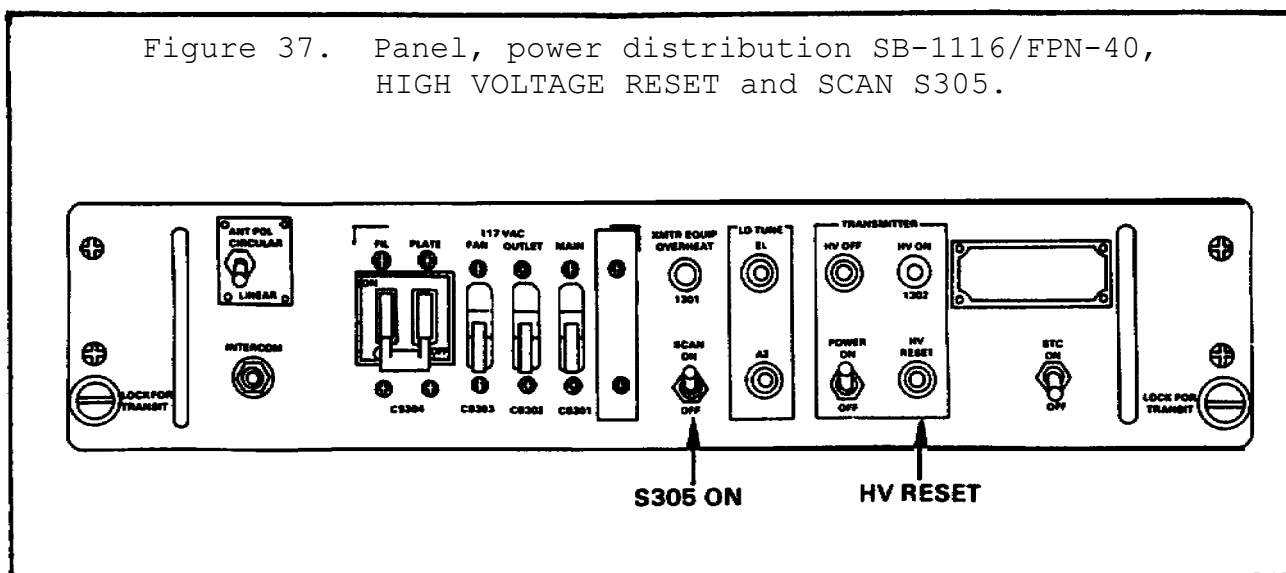
- _____ Control indicator group OA-2664/FPN-40. (See Figure 4.)
- _____ Panel, power distribution SB-1116/FPN-40. (See Figure 5.)
- _____ Indicator, azimuth-elevation range IP-800/FPN-40. (See Figure 6.)
- _____ Control, radar set C-2074/FPN-33. (See Figure 4.)
- _____ Synchronizer-generator SN-386/FPN-40. (See Figure 4.)
- _____ Computer, navigational CP-338/FPN-33. (See Figure 4.)
- _____ SCAN switch S305. (See Figure 5.)
- _____ Grid line face plate. (See Figure 6.)
- _____ SURVEILLANCE-FINAL APPROACH-HEIGHT FINDER switch S2802. (See Figure 7.)
- _____ RANGE, NAUTICAL MILES switch S1501. (See Figure 14.)
- _____ PRECISION HORIZONTAL CENTERING control R1506. (See Figure 8.)
- _____ PRECISION CENTER AZ control R1507. (See Figure 8.)
- _____ EXPANSION AZ control R1510. (See Figure 8.)
- _____ PRECISION CENTER EL control R1508. (See Figure 8.)
- _____ EXPANSION EL control R1509. (See Figure 8.)
- _____ ART AZ-OPERATE-ART EL switch S401. (See Figure 9.)
- _____ Angle volts output test point TP405. (See Figure 9.)
- _____ ARTIFICIAL ANGLE VOLTS control R402. (See Figure 9.)
- _____ Ground test point TP419. (See Figure 9.)

- _____ Release handles for synchronizer-generator SN-386/FPN-40. (See Figure 10.)
- _____ Interlock for synchronizer-generator SN-386/FPN-40. (See Figure 10.)
- _____ PRECISION 10-MILE SWEEP control R1523. (See Figure 11.)
- _____ PRECISION SWEEP LENGTH control R1516. (See Figure 11.)
- _____ INTENSITY control R2404. (See Figure 13.)
- _____ RANGE MARK GAIN control R1512. (See Figure 14.)

Learning Event 2: ADJUST PPI DELAY CONTROL

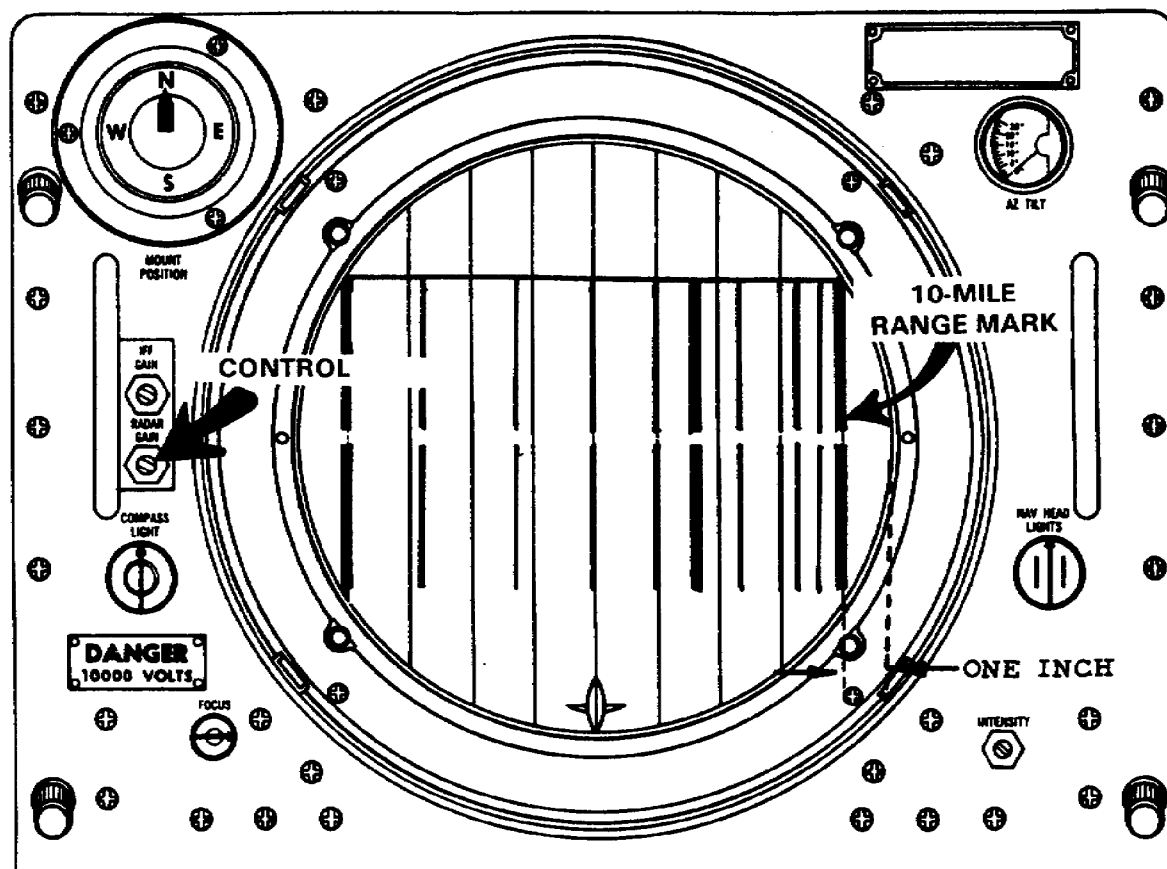
1. Learning Event 2 will enable you to locate and identify components of control indicator group OA-2264/FPN-40 and operator controls of radar set AN/FPN-40, as well as interpret information displayed on cathode ray tube (CRT) of radar set AN/FPN-40.
2. Location and initial settings of components and controls.
 - a. Locate the transmitter HV RESET switch and SCAN switch S305 on panel, power distribution SB-1116/FPN-40 (Figure 37).

Figure 37. Panel, power distribution SB-1116/FPN-40, HIGH VOLTAGE RESET and SCAN S305.



- b. Locate the RADAR GAIN control on indicator, azimuth-elevation-range IP-800/FPN-40 (Figure 38).

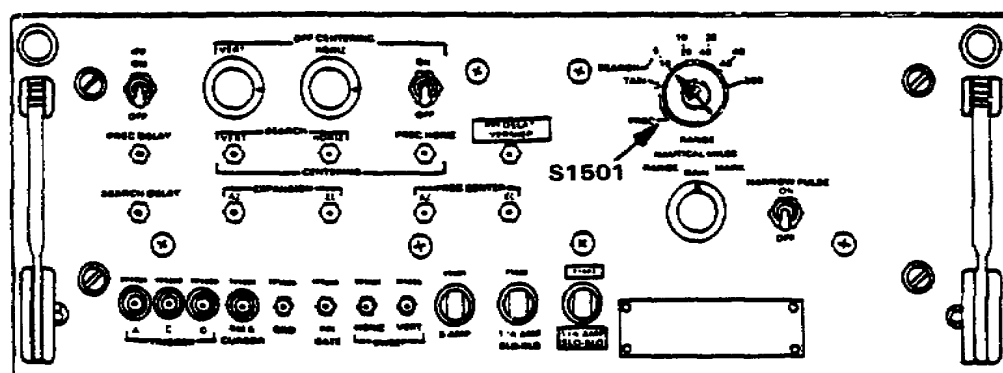
Figure 38. Indicator, azimuth-elevation-range
IP-800/FPN-40 RADAR GAIN control.



c. Locate the SURVEILLANCE-FINAL APPROACH-HEIGHT FINDER switch and the IF GAIN AZ control on control radar set C-2074/FPN-33 (Figure 39).



Figure 40. Synchronizer-generator, marker-electronic SN-386/FPN-40, PPI delay and S1501.



e. Locate the release handles and disengage them. Pull the drawer forward and locate the INTERLOCK switch S102. Pull the INTERLOCK switch forward. Release handles and INTERLOCK located on synchronizer-generator, marker-electronic SN-386/FPN-40 (Figure 10).

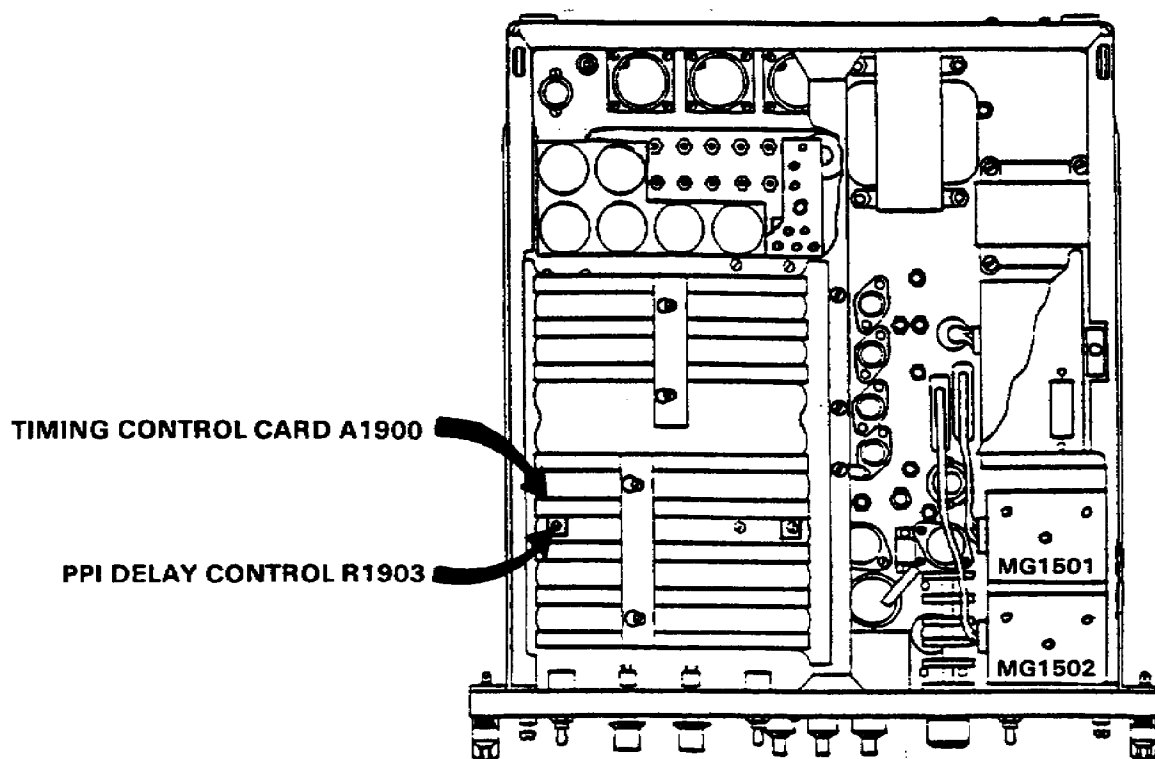
NOTES: The INTERLOCK-switch must be pulled forward to restore power to the synchronizer-generator SN-386/FPN-40.

An INTERLOCK serves as an OFF/ON switch. Because of its design the INTERLOCK provides additional functions. First, it removes the power from the unit when an operator opens a panel or drawer. This provides safety for the operator. Secondly, when testing is required by the repair person, it restores power to the unit when placed in its most forward position.

f. Locate the timing control card A1900 inside synchronizer-generator, marker-electronic SN-386/FPN-40 (Figure 41).

g. Locate the PPI DELAY control R1903 on timing control card A1900 (Figure 41).

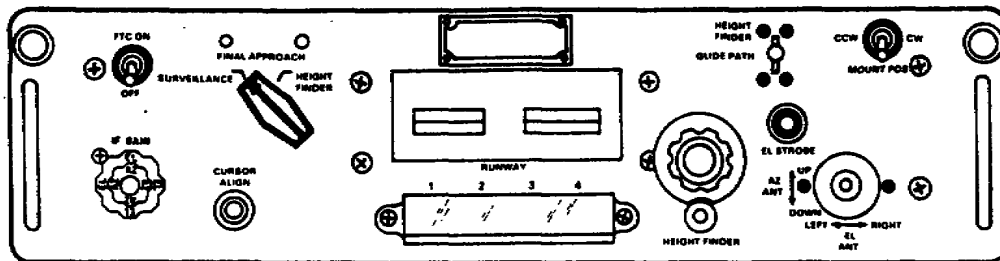
Figure 41. Synchronizer-generator, marker-electronic SN-386/FPN-40



3. Adjust the PPI DELAY control on radar set AN/FPN-40.

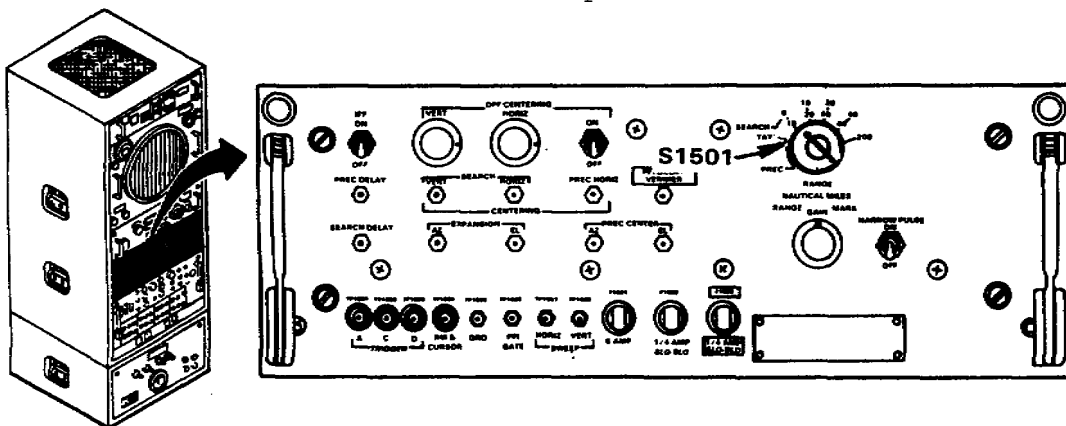
a. Place the SURVEILLANCE-FINAL APPROACH-HEIGHT FINDER switch located on control radar set C-2074/FPN-33 to the SURVEILLANCE position (Figure 42).

Figure 42. Control radar set C-2074/FPN-33.



b. Place the RANGE NAUTICAL MILES switch S1501, located on synchronizer-generator SN-386/FPN-40, to the TAXI position (Figure 43).

Figure 43. P/O synchronizer-generator, marker-electronic SN-386/FPN-40, RANGE NAUTICAL MILES switch S1501 (shown in the TAXI position).



c. Depress the HV RESET switch and turn the SCAN switch ON, both switches are located on the power panel distribution SB-1116/FPN-40 (Figure 37).

d. Locate and center the PPI VENIER control on synchronizer-generator, marker-electronic SN-386/FPN-40 (Figure 40).

NOTE: To center the PPI VENIER control, the PPI VENIER control must be turned fully clockwise and then counterclockwise. It is centered when it is set at the mid-position between the two extremes.

e. Rotate the IF GAIN, AZ control fully clockwise while observing the CRT, located on control radar set C-2074/FPN-33 (Figure 42).

f. Rotating the PPI DELAY control (R1903) will cause the main bang (video) to move toward the touchdown marker (Figure 44). The correct setting for the PPI DELAY control (1903) is when the innermost edge of the video return (main bang) just touches the touchdown marker (Figure 45). The touchdown marker is often referred to as the TD marker.

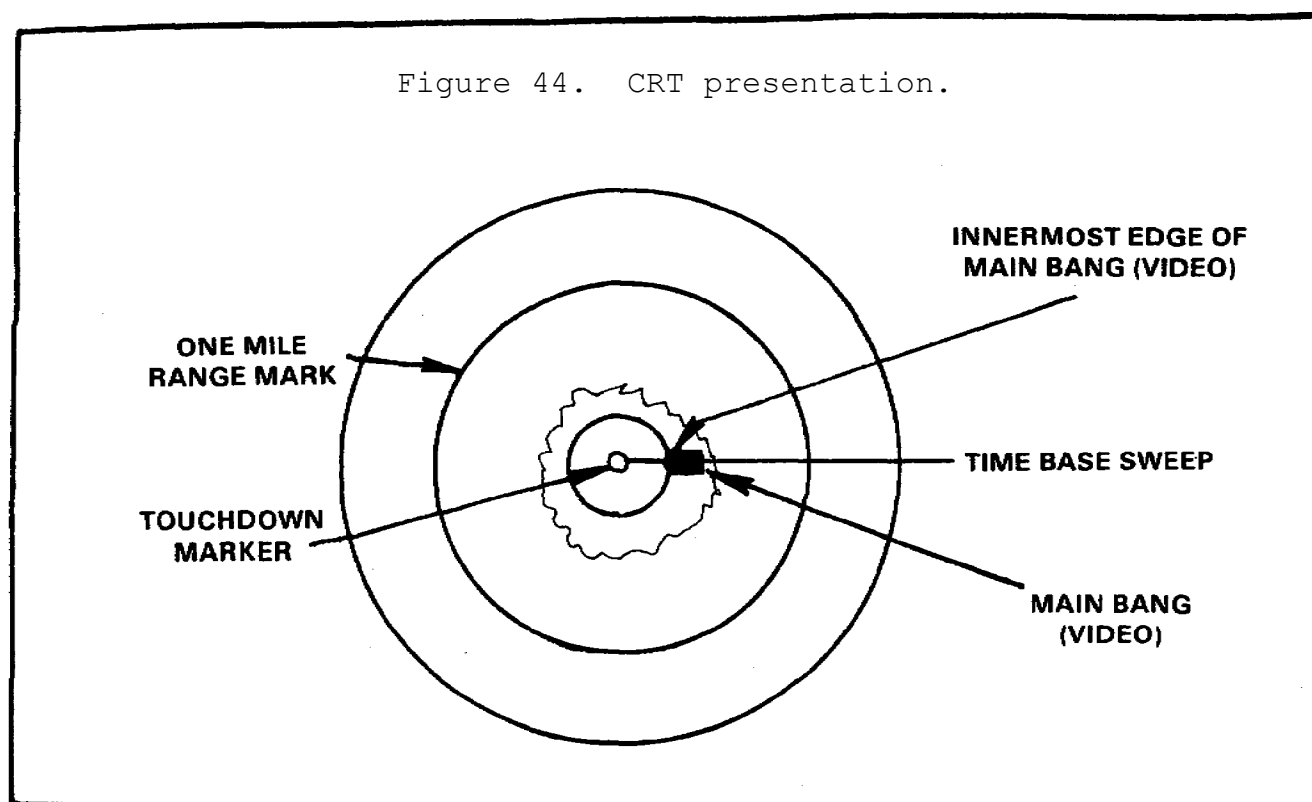
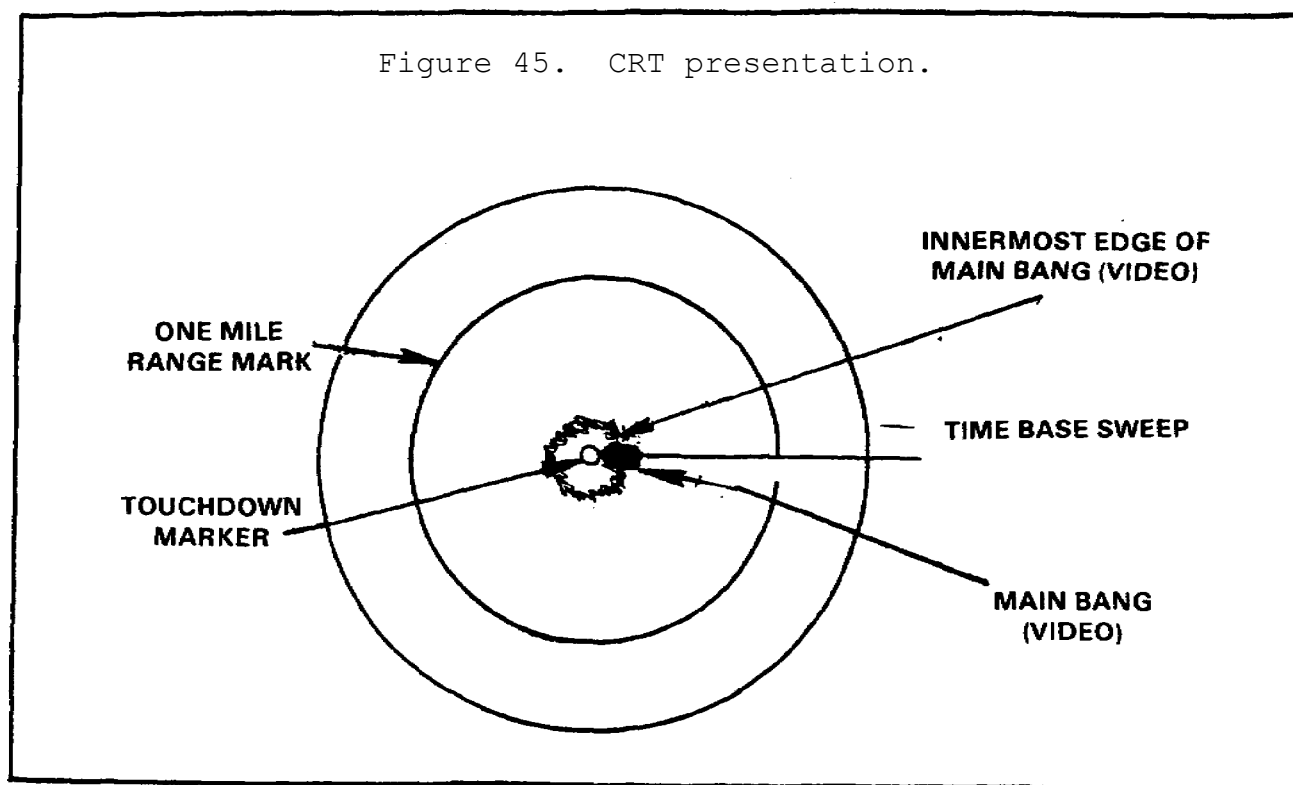


Figure 45. CRT presentation.



NOTES: The main bang (video) will move towards the center of the CRT when R1903 is adjusted.

R1903 is located inside the synchronizer-generator, marker-electronic SN-386/FPN-40 on the timing control card A1900 (Figure 41).

g. Rotate the PPI DELAY control (R1903) until the innermost edge of the video return (main bang) just touches touchdown marker.

h. You have completed the PPI DELAY control adjustment. In doing so, you have ensured the proper orientation of radar video in respect to range. Restore the radar set to its operating condition by securing synchronizer-generator drawer SN-386/FPN-40.

4. Using this checklist, review the location of the following components and controls.

_____ Transmitter HV RESET switch. (See Figure 37.)

_____ RADAR GAIN control. (See Figure 38.)

_____ IF GAIN, AZ control. (See Figure 39.)

_____ PPI DELAY VENIER control. (See Figure 40.)

_____ Timing control card A1900. (See Figure 41.)

_____ PPI DELAY control R1903. (See Figure 41.)

Learning Event 3:

ADJUST PPI DISPLAY ON RADAR SET AN/FPN-40

1. Learning Event 3 will enable you to locate and identify control indicator group OA-2664/FPN-40 components, and PPI display adjustment controls, as well as interpret information displayed on the cathode ray tube (CRT) of radar set AN/FPN-40.

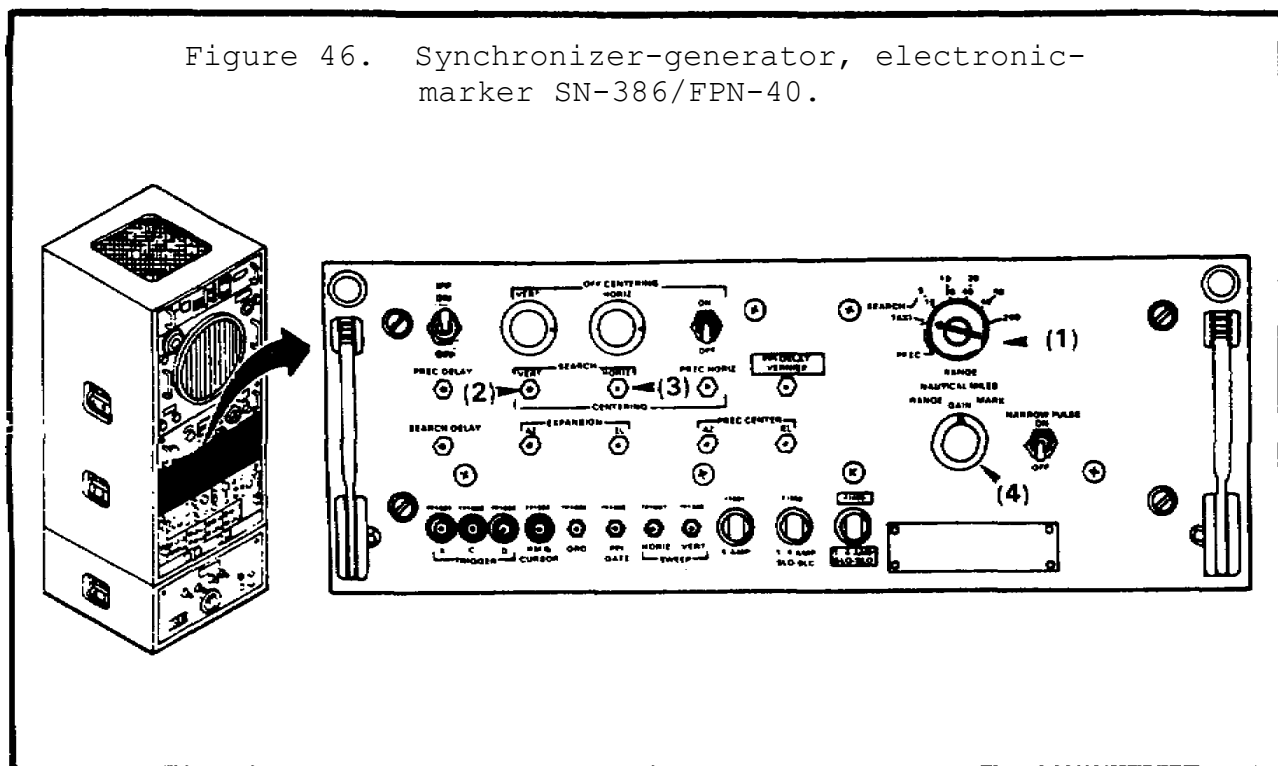
2. Location and initial settings of components and controls.

a. Locate INTENSITY control R2404 on indicator azimuth-elevation-range IP-800/FPN-40 (Figure 13).

b. Locate the following controls on the front panel of the synchronizer generator, electronic marker, SN-386/FPN-40 (Figure 46).

- (1) RANGE NAUTICAL MILES switch S1501.
- (2) SEARCH VERTICAL CENTERING control R1504.
- (3) SEARCH HORIZONTAL CENTERING control R1505.
- (4) RANGE MARK GAIN control R1512.

Figure 46. Synchronizer-generator, electronic-marker SN-386/FPN-40.



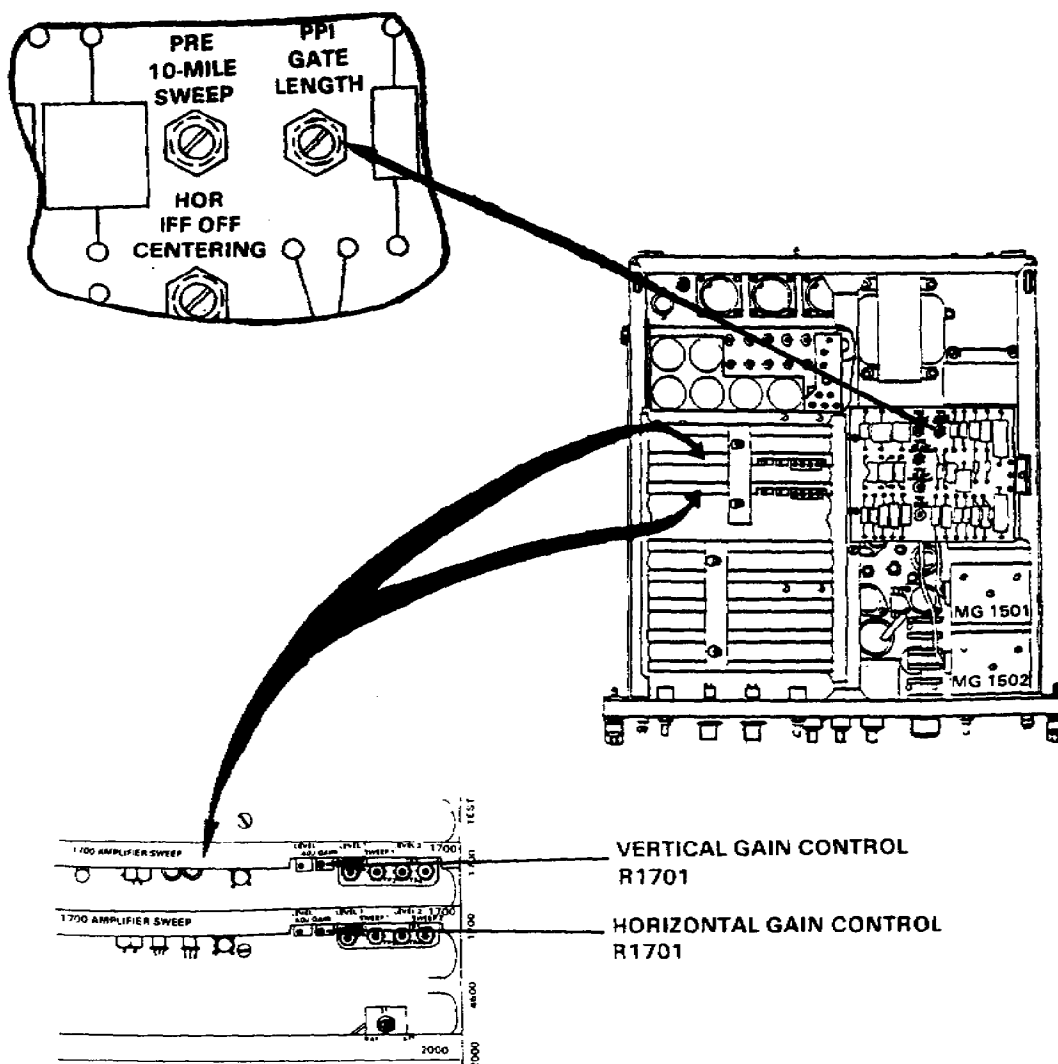
NOTE: An INTERLOCK serves as an OFF-ON switch. Because of its design, the INTERLOCK provides additional functions. First, it removes the power from the unit when an operator opens a panel or drawer. This provides safety for the operator. Secondly, when testing is required by the repair person, it restores power to the unit when placed in its most forward position.

c. Locate release handles and INTERLOCK on synchronizer-generator, electronic-marker, SN-386/FPN-40 (Figure 10). Disengage release handles and pull the synchronizer-generator, electronic-marker, SN-386/FPN-40 drawer forward until it reaches its mechanical stops. Pull INTERLOCK switch forward.

d. Locate the following controls on the inside of synchronizer-generator, electronic-marker, SN-386/FPN-40 (Figure 47).

- (1) PPI GATE LENGTH control R1511.
- (2) HORIZONTAL GAIN control R1701 (horiz amp card).
- (3) VERTICAL GAIN control R1701 (vert amp card).

Figure 47. Top inside view of synchronizer-generator, electronic-marker, SN-386/FPN-40.

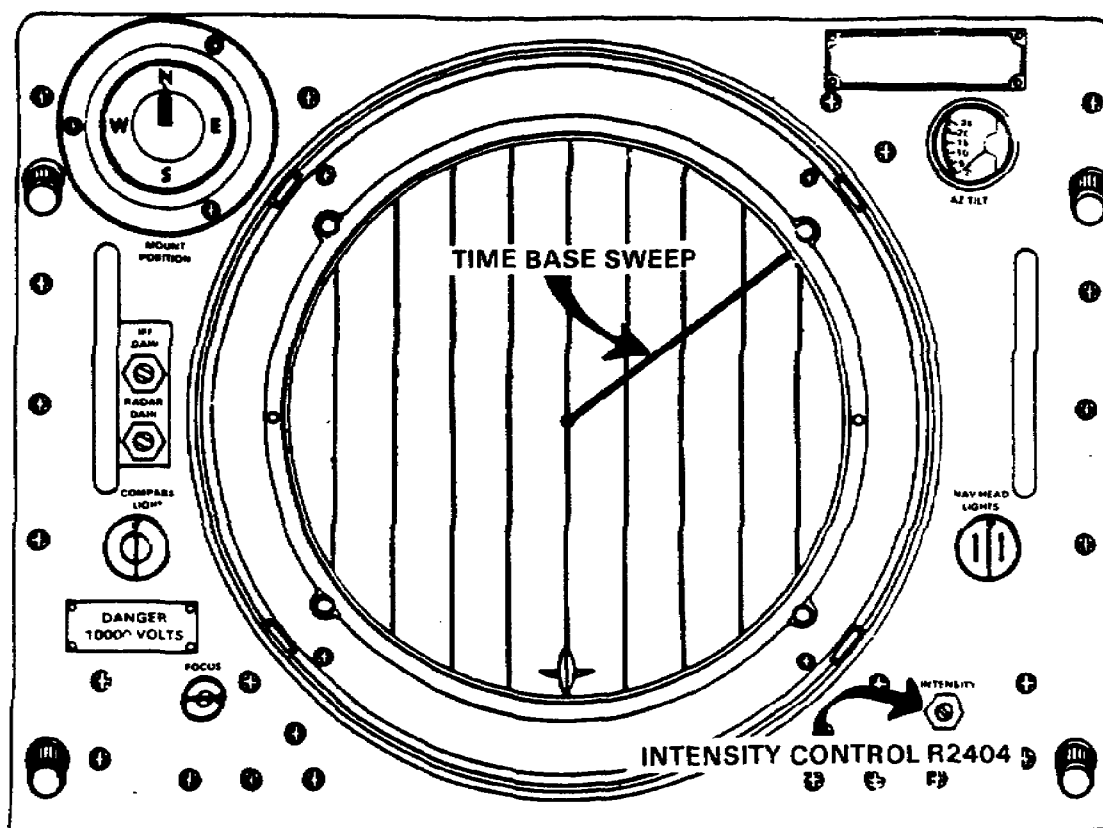


e. Place SCAN switch S305 to the ON position on panel, power distribution SB-1116/FPN-40 (Figure 37).

f. Place SURVEILLANCE-FINAL APPROACH-HEIGHT FINDER switch S2805 in the SURVEILLANCE position, located on control radar set C-2074/FPN-33 (Figure 42).

g. Rotate INTENSITY control R2404 clockwise until the time of base sweep is just visible on the CRT on indicator azimuth-elevation-range IP-800/FPN-40 (Figure 48).

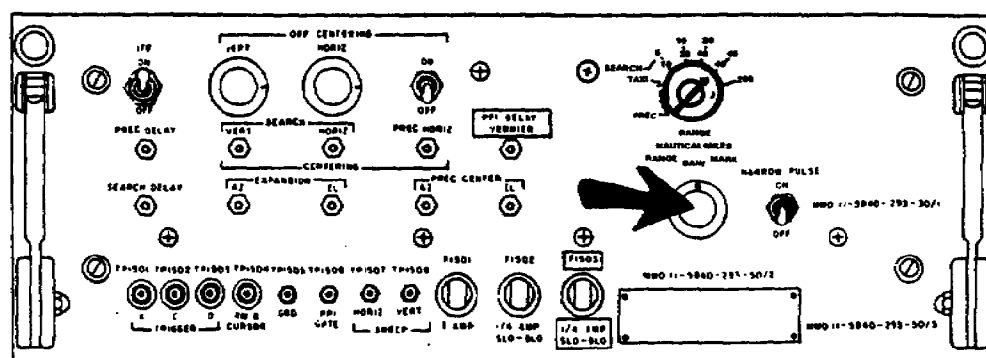
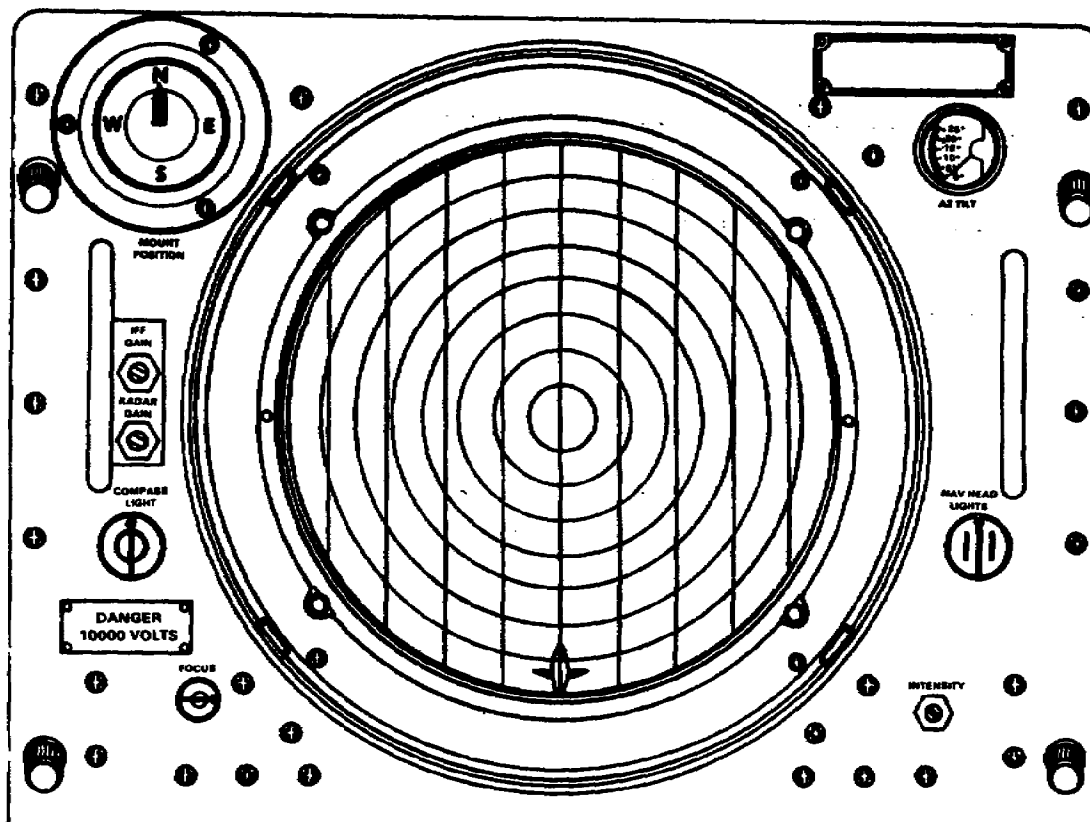
Figure 48. Indicator, azimuth-elevation-range IP-800/FPN-40, surveillance display of time base sweep.



h. Place RANGE NAUTICAL MILES switch S1501 to the SEARCH 40-MILE position, located on synchronizer-generator, electronic-marker SN-386/FPN-40 (Figure 49).

i. Rotate the RANGE MARK GAIN control R1512 clockwise until the range marks appear on the time base sweep, located on the synchronizer-generator, electronic-marker SN-386/FPN-40 (Figure 49).

Figure 49. RANGE MARK GAIN control and RANGE NAUTICAL MILES switch in SEARCH 40-MILE position.



QUESTION: When you rotate the RANGE MARK GAIN control R1512 clockwise, the range marks _____ on the time base sweep.

j. Examine Figure 49. Figure 49 shows a properly aligned PPI display in 40-mile range.

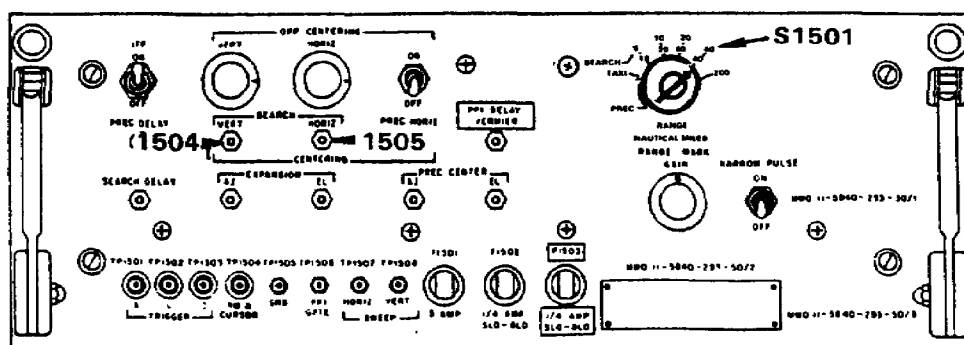
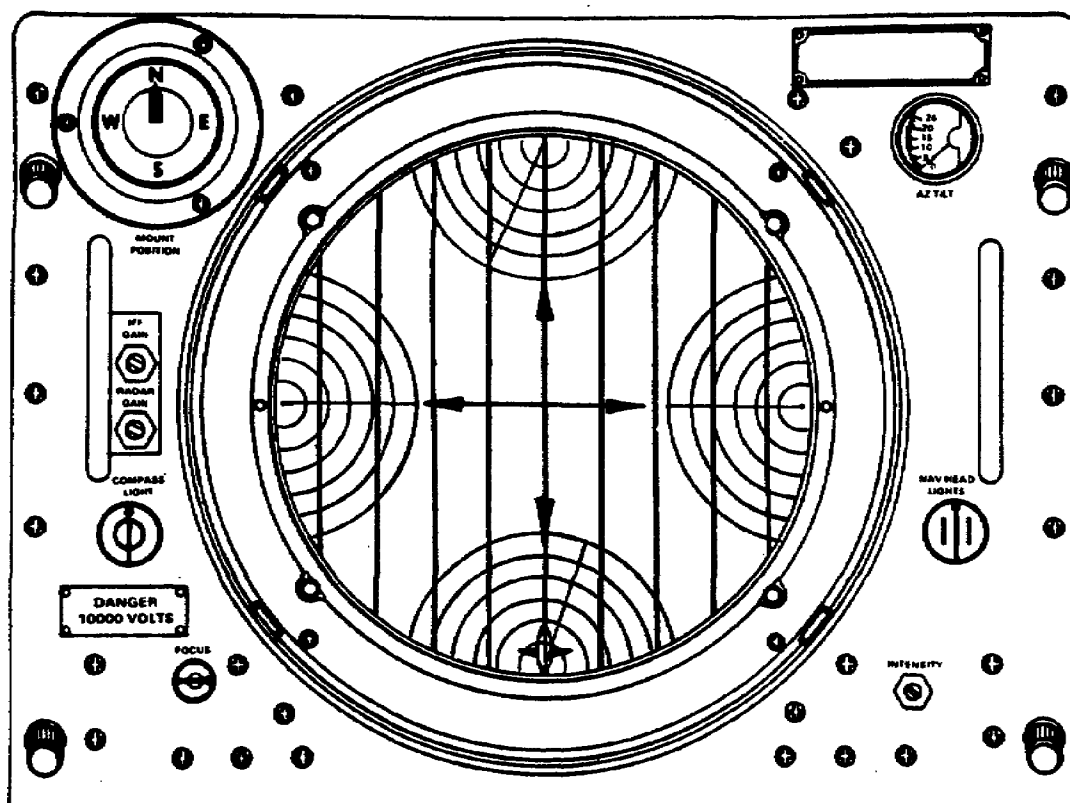
(1) The start of the time base sweep is positioned in the center of the CRT.

(a) Adjusting the SEARCH VERTICAL CENTERING control R1504 will cause the start of the time base sweep to move up or down.

(b) Adjusting the SEARCH HORIZONTAL CENTERING control R1505 will cause the start of the time base sweep to move left or right.

(c) Rotate R1504 and R1505, located on the synchronizer-generator, electronic-marker SN-386/FPN-40, slightly clockwise and then counterclockwise and observe the movement of the PPI display on the CRT (Figure 50).

Figure 50. Indicator, azimuth-elevation-range
IP-800/FPN-40, VERTICAL CENTERING
control R1504, and HORIZONTAL CENTERING
control R1505.

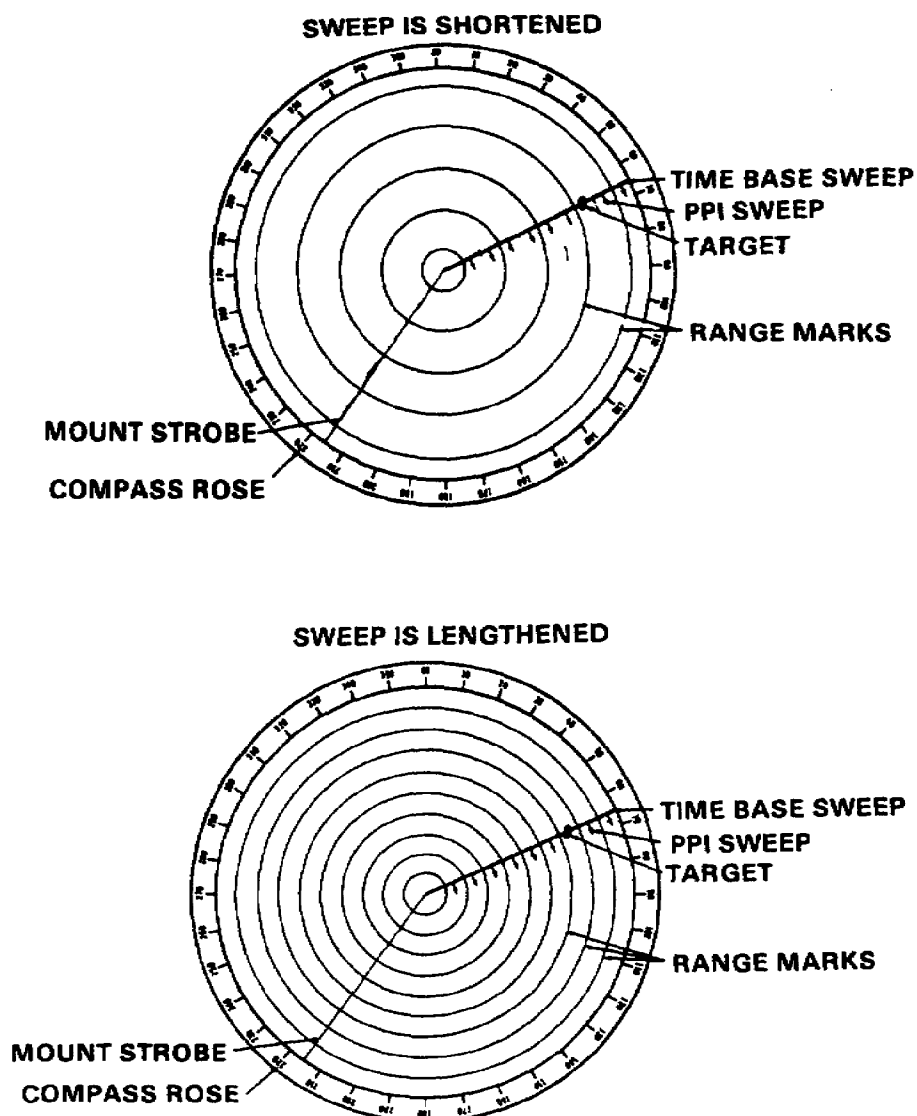


(2) The 40-mile range consists of eight intensified rings, each representing 5 miles, on the time base sweep called range marks (Figure 49).

(a) Adjusting the PPI GATE LENGTH control R1511 will cause the time base sweep to lengthen or shorten. As the time base sweep is shortened, the number of range marks will decrease and; as it is lengthened, the number of range marks will increase.

(b) Rotate the PPI GATE LENGTH control R1511 slightly clockwise and then counterclockwise and observe the PPI display (Figure 51).

Figure 51. PPI display on CRT 40-mile range.

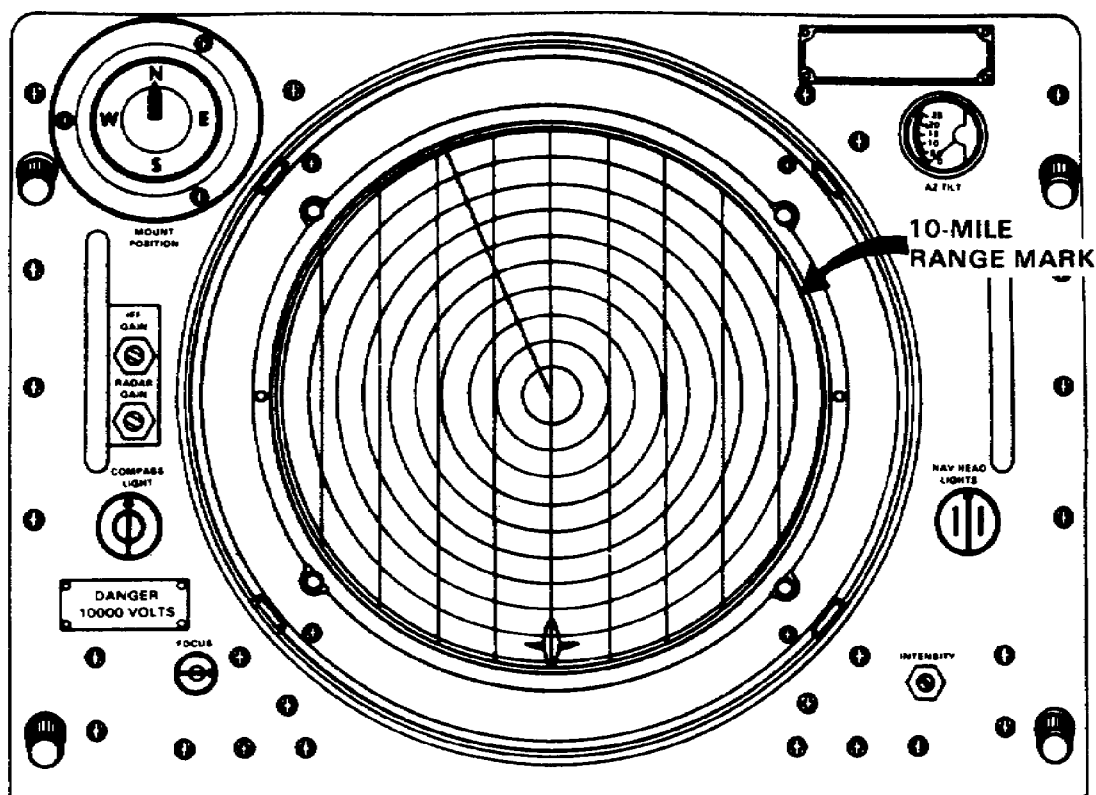


k. Place the RANGE NAUTICAL MILES switch S1501 to the SEARCH 10-MILE position. The RANGE NAUTICAL MILES switch is located on the synchronizer-generator, electronic-marker SN-386/FPN-40 (Figure 30).

1. Examine Figure 52. This figure shows a properly aligned PPI display in 10-mile range.

NOTE: The start of the time base sweep should be centered on the radar CRT as it was in the 40-mile presentation. Once the start of the sweep is set, it should remain centered for all PPI ranges.

Figure 52. PPI display 10-mile range.

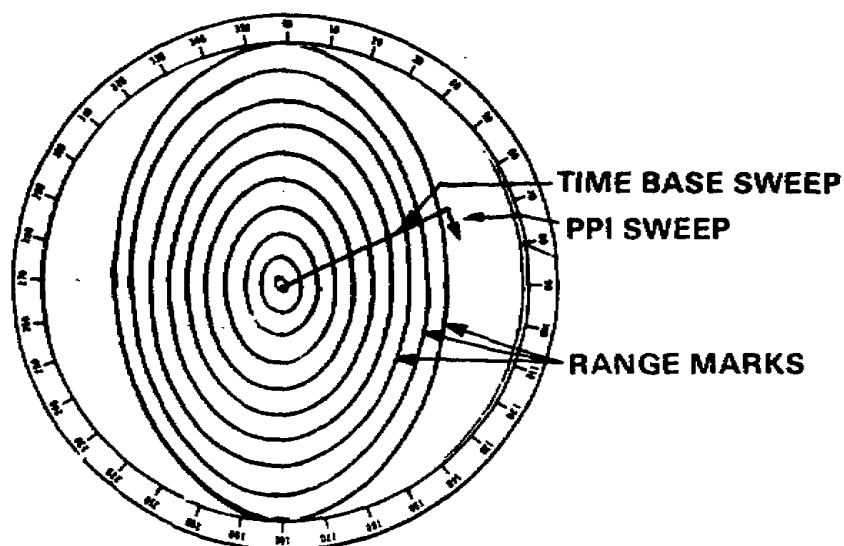


m. In Figure 52, there are 10 intensified circles on the time base sweep (range marks). The tenth circle (10-mile range mark) is approximately 1/8 inch from the edge of the CRT. All range mark rings are round in pattern.

(a) Adjusting the HORIZONTAL and VERTICAL GAIN controls (both R1701) will extend or shorten the time base sweep. Observing the range marks will be the best indicator of the change in the length of the time base sweep.

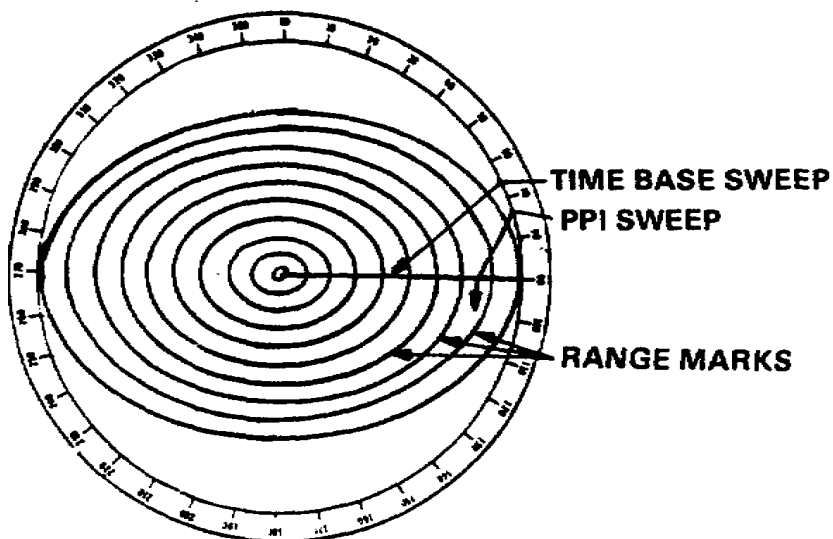
(b) Adjust the VERTICAL GAIN CONTROL R1701 (Figure 47) slightly clockwise and then counterclockwise and observe the changes that occur to the PPI display (Figure 53).

Figure 53. PPI vertical gain display maladjusted.



(c) Rotate the HORIZONTAL GAIN control R1701 slightly clockwise and then counterclockwise and observe the changes that occur in the PPI display (Figure 54).

Figure 54. PPI horizontal gain display maladjusted.



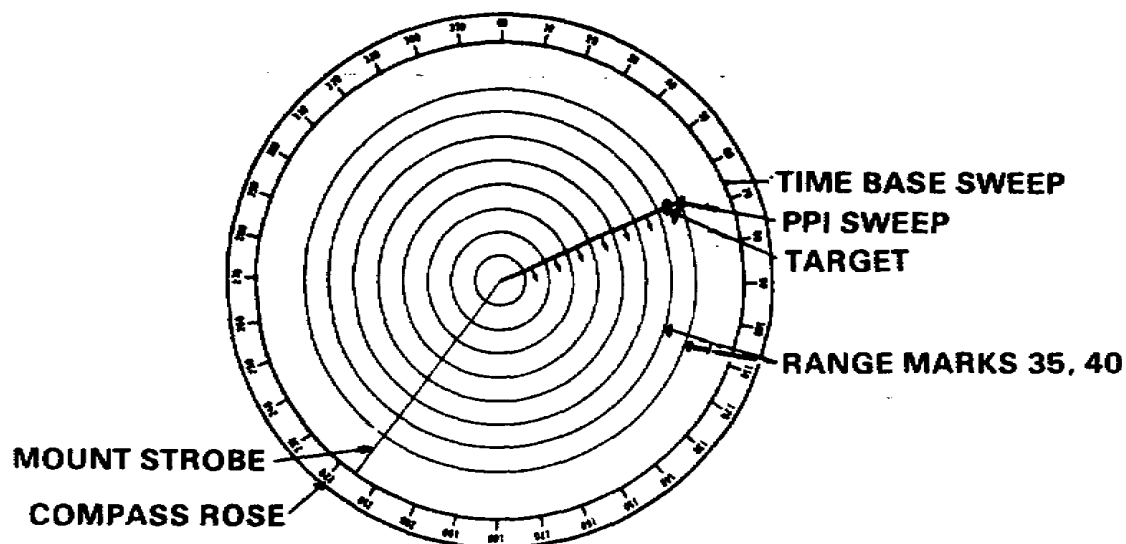
3. Adjust PPI display on radar set AN/FPN-40.

a. Place the RANGE NAUTICAL MILES switch S1501 to SEARCH 40, located on SN-386/FPN-40.

b. Adjust SEARCH VERTICAL CENTERING control R1504 and SEARCH HORIZONTAL CENTERING control R1505 to center the PPI display on the CRT. R1504 and R1505 are located on SN-386/FPN-40 (Figure 50).

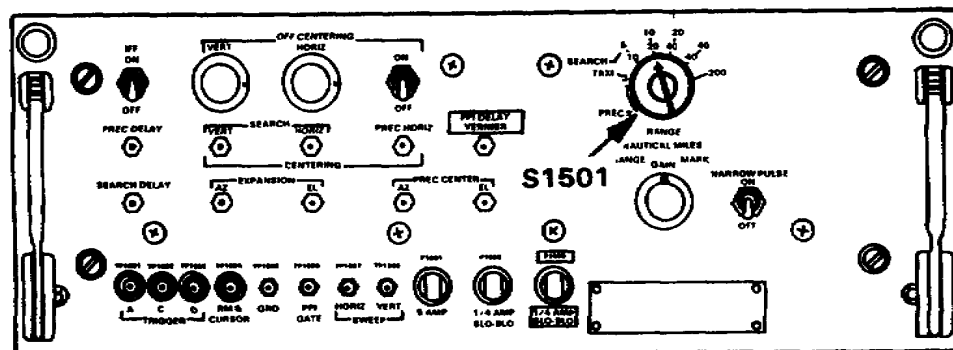
c. Adjust PPI GATE LENGTH control R1511 (Figure 47) so that the display ends just after the 40-mile range mark (Figure 55).

Figure 55. Time base sweep ending after 40-mile range mark.



d. Place the RANGE NAUTICAL MILES switch S1501 to SEARCH 10, located on SN-386/FPN-40 (Figure 56).

Figure 56. S1501 shown in search 10-mile range.



e. Adjust the VERTICAL and HORIZONTAL GAIN controls R1701 (Figure 47) to expand the PPI display until the 10-mile range mark is 1/8 inch from the edge of the CRT and all range mark rings have the best obtainable circularity (Figure 52).

f. You have completed the PPI display alignment. In doing so, you have ensured proper positioning and range of the PPI display.

4. Using this checklist, review the location of the following components and controls.

_____ SEARCH VERTICAL CENTERING control R1504. (See Figure 50.)

_____ SEARCH HORIZONTAL CENTERING control R1505. (See Figure 50.)

_____ PPI GATE LENGTH control R1511. (See Figure 47.)

_____ HORIZONTAL GAIN control R1701. (See Figure 47.)

_____ VERTICAL GAIN control R1701. (See Figure 47.)

5. Using this checklist, review the control settings.

_____ INTENSITY control R2404 clockwise for a just visible time base sweep. (See Figure 48.)

_____ RANGE MARK GAIN control R1512 for appearance of range marks. (See Figure 49.)

Learning Event 4:

ADJUST IFF DISPLAY OF RADAR SET AN/FPN-40

1. Learning Event 4 will enable you to describe the adjustment of the IFF display, the function and use of components, and learn the function and operation of the RANGE NAUTICAL MILES switch.

Special Instructions: This lesson requires you to answer questions concerning the IFF display of radar set AN/FPN-40. If you fail to obtain the desired results, reread this learning event and retake the test.

2. Location and initial settings of components and controls.

a. Locate the following items on panel, power distribution SB-1116/FPN-40 (Figure 37).

(1) SCAN switch S305.

(2) TRANSMITTER HAV RESET switch.

b. Locate the following items on indicator, azimuth-elevation-range IP-800/FPN-40 (Figure 38).

(1) RADAR GAIN control.

(2) CRT.

c. Locate the RANGE NAUTICAL MILES switch, S1501, on synchronizer-generator, electronic-marker SN-386/FPN-40 (Figure 40).

d. Locate the following items inside synchronizer-generator, electronic-marker SN-386/FPN-40 (Figure 57).

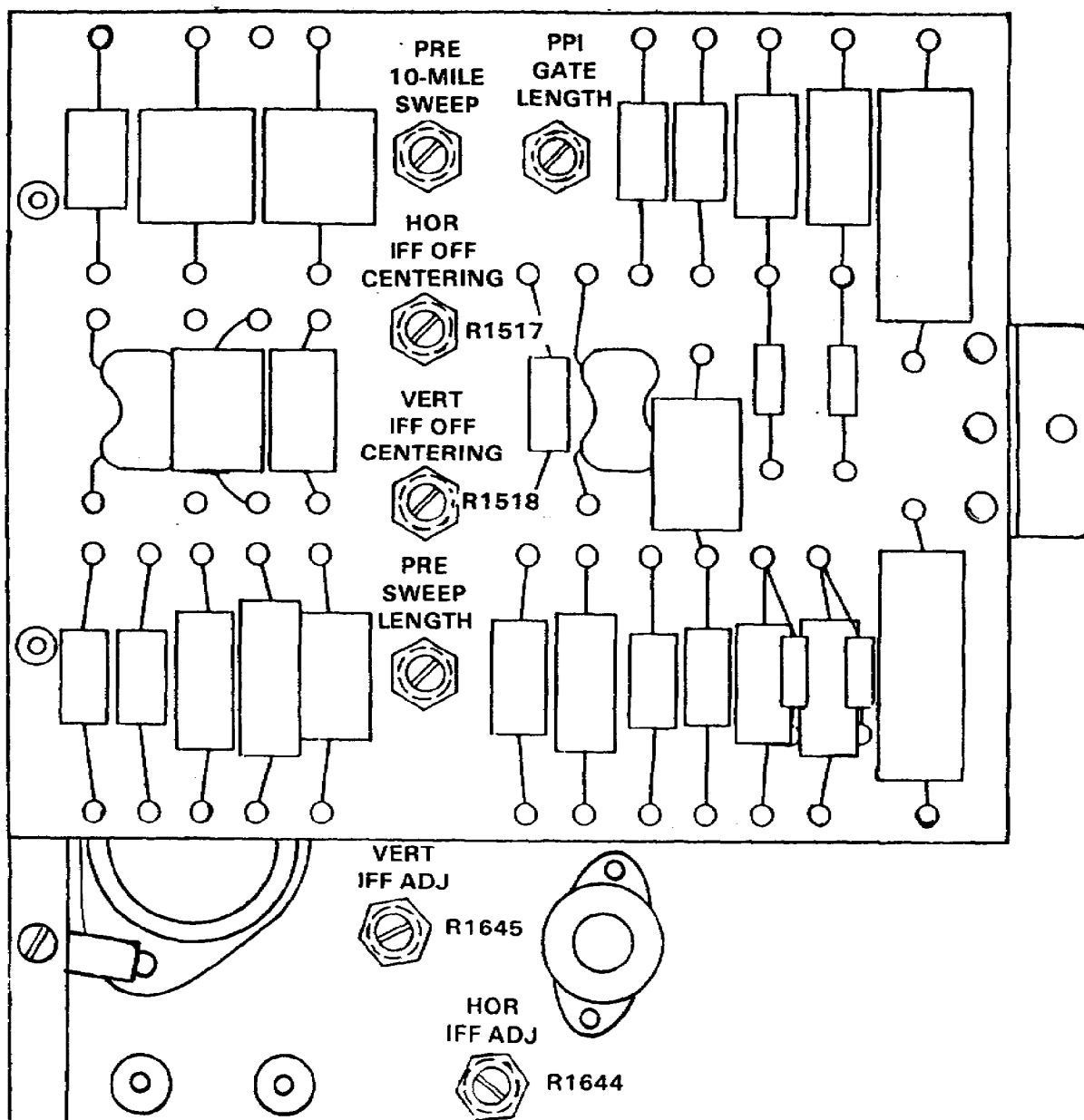
(1) HOR IFF ADJ control R1644.

(2) VERT IFF ADJ control R1645.

(3) HOR IFF OFF CENTERING control R1517.

(4) VERT IFF OFF CENTERING control R1518.

Figure 57. Synchronizer-generator, electronic-
marker SN-386/FPN-40.



3. Performance Action. To adjust IFF display of radar set AN/FPN-40.

a. Place SURVEILLANCE-FINAL APPROACH-HEIGHT FINDER switch S2802 to SURVEILLANCE (Figure 42).

b. Place SCAN switch S305 to ON (Figure 37).

c. Place RANGE NAUTICAL MILES switch S1501 to SEARCH 10 (Figure 56).

d. Place IFF switch 51502 to ON (Figure 56).

NOTE: A second sweep will appear on the CRT in IP-800/FPN-40.

e. Depress TRANSMITTER HV RESET switch on the SB-1116/FPN-40 (Figure 37).

f. Adjust IF GAIN AZ control and RADAR GAIN control on the IP-800/FPN-40 for optimum video on the IP-800/FPN-40 display (CRT).

NOTE: IF GAIN AZ control is adjusted-correctly when maximum intensity of video is present (IF GAIN AZ control maximum CW).

g. Perform LO tune to ensure that the local oscillator output is 30 MHz higher in frequency than the received radar RF signal.

NOTE: RADAR GAIN should be adjusted for maximum intensity of video, just below the point where the video intensity starts to bloom.

h. Place RANGE NAUTICAL MILES switch S1501 to SEARCH 40 (Figure 49).

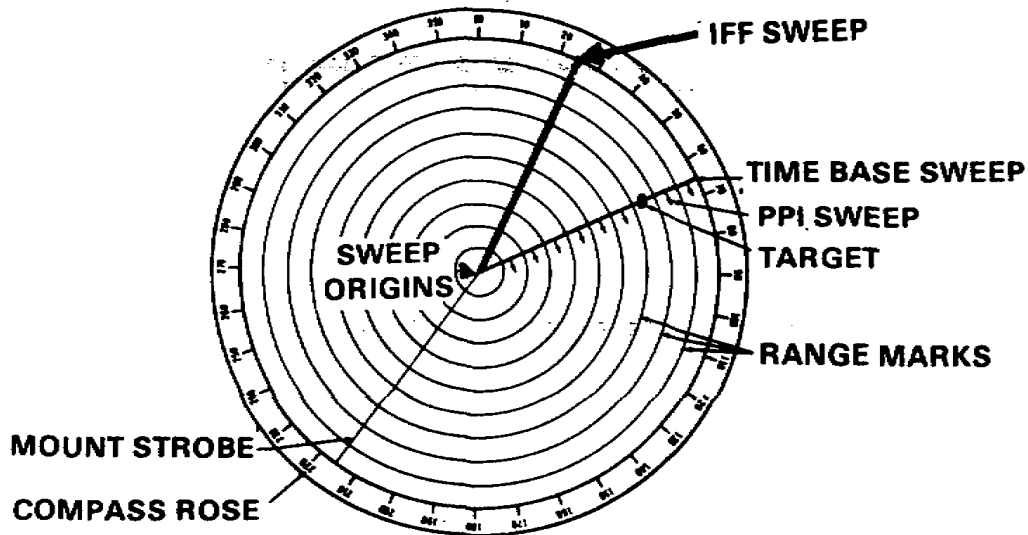
i. Adjust HOR IFF ADJ control R1644 and VERT IFF ADJ control R1645 (Figure 57) to center the origin of the IFF display on the CRT in IP-800/FPN-40.

j. Place RANGE NAUTICAL MILES switch S1501 to SEARCH 5 (Figure 40).

k. Adjust HOR IFF OFF CENTERING control R1517 and VERT IFF OFF CENTERING control R1518 (Figure 57) to place the origin of the IFF display on the CRT in IP-800/FPN-40 to correspond with the placement of the IFF antenna. If the radar and IFF antennas are so close that the IFF antenna is not visible on IP-800/FPN-40 display, superimpose radar and IFF sweep origins.

l. You would repeat i through k above until radar and IFF sweep origins are superimposed for all ranges. (Figure 58 shows the CRT with the IFF display properly aligned.)

Figure 58. CRT with IFF sweep display.



4. Using this checklist, review the location of the following components and controls.

- _____ TRANSMITTER HV RESET switch. (See Figure 37.)
- _____ RADAR GAIN control. (See Figure 38.)
- _____ CRT. (See Figure 38.)
- _____ RANGE NAUTICAL MILES switch S1501. (See Figure 40.)
- _____ HOR IFF ADJ control R1644. (See Figure 57.)
- _____ VERT IFF ADJ control R1645. (See Figure 57.)
- _____ HOR IFF OFF CENTERING control R1517. (See Figure 57.)
- _____ VERT IFF OFF CENTERING control R1518. (See Figure 57.)